B&P TUNNEL PROJECT

RECORD OF DECISION

BALTIMORE & POTOMAC TUNNEL PROJECT

BALTIMORE, MARYLAND

MARCH 2017

U.S. Department of Transportation
Federal Railroad Administration

Maryland Department of Transportation

FEDERAL RAILROAD ADMINISTRATION

RECORD OF DECISION

FOR THE

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I. INTRODUCTION

This Record of Decision (ROD) documents the Federal Railroad Administration's (FRA) decision with regard to the Baltimore and Potomac (B&P) Tunnel Project ("Project"). In making its decision, FRA considered the information and analysis included in the Draft and Final Environmental Impact Statements for the Project and public and agency comments.

FRA has prepared this ROD in compliance with the National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. § 4321 *et seq*.), the Council of Environmental Quality (CEQ) NEPA Regulations (40 C.F.R. Parts 1500-1508), the FRA Procedures for Considering Environmental Impacts (64 Federal Register 28545 [May 26, 1999]), and FRA's Update to NEPA Implementing Procedures (78 Federal Register Part 2713 [January 14, 2013]). The Federal Transit Administration (FTA) is involved with the development of the Project through the NEPA process as a cooperating agency in accordance with the CEQ regulation 40 C.F.R. § 1508.5.

The proposed Project will replace the 1.4-mile-long rail tunnel located along the Northeast Corridor (NEC) in Baltimore, Maryland. The B&P Tunnel is owned by Amtrak and used for Regional and Acela intercity passenger trains, Maryland Area Rail Commuter (MARC) passenger trains, and Norfolk Southern Railway (NS) freight trains. Built in 1873, the B&P Tunnel is one of the oldest structures on the NEC. The existing double-track tunnel was constructed out of brick and stone masonry, with additional materials added over time.

In accordance with NEPA, FRA, as the lead Federal agency, and the Maryland Department of Transportation (MDOT) issued a Draft Environmental Impact Statement (DEIS) in December, 2015 that evaluated the environmental impacts of three build alternatives (Alternatives 3A, 3B, and 3C) in comparison to the No-Build Alternative. FRA and MDOT issued a Final Environmental Impact Statement (FEIS) on November 25, 2016. Based on the analysis of the Project's potential environmental effects in the DEIS and public and agency comments, the FRA and MDOT identified Alternative 3B as the Preferred Alternative for the Project in the FEIS.

In consideration of the analysis in the DEIS and FEIS and substantive agency and public comments, FRA selects the Preferred Alternative (hereinafter referred to as the Selected Alternative or Alternative 3B). Of the alternatives considered, Alternative 3B best meets the Project's Purpose and Need while minimizing environmental impacts. Alternative 3B replaces the aging infrastructure of the existing B&P Tunnel, which is nearing the end of its useful life; improves travel time and reliability on the portion of the NEC between Penn Station, Baltimore, and the Gwynns Falls Bridge; and provides for an improved West Baltimore MARC Station that will be compliant with the Americans with Disabilities Act (ADA). A description of the Selected Alternative is included in **Section III.E,** and more detail is available in the FEIS**.**

II. PURPOSE AND NEED

A. Project Background

The existing B&P Tunnel is a crucial link on the NEC Main Line, which runs through eight states and Washington, DC. The NEC is the nation's most congested rail corridor and one of the highest volume corridors in the world (Amtrak, 2010a). Currently, the fully electrified NEC provides rail connections through Washington, DC; Baltimore; Philadelphia; New York; and Boston. The NEC moves over 259 million passengers and 14 million car miles of freight cargo each year (Amtrak, 2010a).

As shown in **Figure 1**, the existing B&P Tunnel runs beneath several West Baltimore neighborhoods, including Bolton Hill, Madison Park, Sandtown-Winchester, and Upton. It is approximately 7,500 feet (1.4 miles) long and is comprised of three shorter tunnels: the John Street Tunnel, the Wilson Street Tunnel, and the Gilmor Street

Liberty Square
Burleith Leighton
Hanlon Longwood
Druid Hill Park
Remington
CSX
Better Waverly
Charles Village
East Baltimore Midway
Barclay
Gwynns Falls Pw
Mondawmin
Penn North
McCulloh St
Reservoir Hill
Walbrook
W North Ave
Coppin Heights/Ash-Co-East
Druid Hill Ave
Existing B & P Tunnel
John St Tunnel
Charles North
Penn Station
Amtrak Northeast Corridor
McMechen St
Wilson St Tunnel
N Monroe St
N Fulton Ave
Eutaw Pl
Bolton Hill
Rosemont
CSX
Sandtown-Winchester
Gilmor St Tunnel
Mid-Town Belvedere
St Paul St
Johnston Square
Howard St Tunnel
Winchester
Bridgeview/Greenlawn
Upton
W Lafayette Ave
Pennsylvania Ave
Martin Luther King Jr. Blvd
Fremont Ave
Mount Vernon
Mosher
Evergreen Lawn
Harlem Park
Seton Hill
Edmondson Ave
Curve 381
W Franklin St
W Mulberry St
West Baltimore MARC
Amtrak Northeast Corridor
Amtrak Gwynns Falls Bridge
Franklin Square
Poppleton
Downtown
University
Carroll-South Hilton
Legend
Existing B&P Tunnel
B & P Tunnel Openings
Light Rail Station
Metro Station
Metro Line
Light Rail Line
Railroad
Interstate
Parks
B&P Tunnel Project
Figure 1: Existing B&P Tunnel
0 0.125 0.25 0.5 Miles
NORTH
U.S. Department of Transportation
Federal Railroad Administration
Maryland Department of Transportation

Tunnel. The rail line was electrified in the 1930s, and the tunnel was rehabilitated in the 1980s. Continual repairs are required to maintain the aging structures.

FRA and MDOT considered the results of two studies, *Baltimore's Railroad Network: Challenges and Alternatives* (FRA, 2005) and *Baltimore's Railway Network: Analysis and Recommendations* (FRA and MDOT, 2011) in the development of the B&P Tunnel Project. The studies evaluated the existing B&P Tunnel, as well as other components of Baltimore's rail network, and underscored the importance of the B&P Tunnel to the NEC. The 2011 report states that "the physical condition of the [existing B&P Tunnel] requires that it be rebuilt or replaced within the next 10-20 years."

The Passenger Rail Investment and Improvement Act of 2008 (PRIIA) and the American Recovery and Reinvestment Act of 2009 (ARRA) established guidelines for the development of intercity and high-speed rail corridors. These two Acts called for a collaborative effort by the federal government, states, railroads, and other key stakeholders to help transform America's transportation system through the creation of a national network of high-speed rail corridors. To achieve this vision, FRA published the *High-Speed Rail Strategic Plan* in April 2009 (USDOT, 2009) and launched the *High Speed Intercity Passenger Rail (HSIPR) Program* in June 2009.

The HSIPR program is improving the safety, reliability, and accessibility of rail infrastructure for passengers around the country through renewal of corridor infrastructure and stations. Through the HSIPR program, FRA is investing $950 million to upgrade some of the most heavily used sections of the NEC. The investments will increase speeds on critical segments, improve on-time performance, and add more seats for passengers, thus enabling one of the nation's busiest corridors to continue to set ridership records and expand transportation options for travelers.

The B&P Tunnel Project environmental review is one of the NEC projects FRA has funded through the HSIPR program. The B&P Tunnel Project is critical to existing and future NEC operations because the current tunnel is a bottleneck in the rail corridor, does not have detour options, and is approaching the end of its useful life.

The Baltimore Metropolitan Council and MDOT amended the Fiscal Year 2011 State Transportation Improvement Program (STIP) list to add federal funds to the 2011-2014 Baltimore Regional Transportation Board's (BRTB) TIP for the existing B&P Tunnel Improvement Project (TIP # 92-1101-99). The BRTB approved funding for the study on May 24, 2011 (Resolution #11-26).

B. Purpose of the Project

The purpose of the Project is to address the structural and operational deficiencies of the existing B&P Tunnel and to accommodate future high-performance intercity passenger rail service goals for the NEC, including:

- To reduce travel time through the B&P Tunnel and along the NEC,
- To accommodate existing and projected travel demand for intercity and commuter passenger services,
- To eliminate impediments to existing and projected operations along the NEC, and
- To provide operational reliability, while accounting for the value of the existing tunnel as an important element of Baltimore's rail infrastructure.

C. Need for the Project

The need for the Project has been defined as follows:

- The existing B&P Tunnel is more than 140 years old and is approaching the end of its useful life with regard to its physical condition. While the tunnel currently remains safe for rail transportation, it requires substantial maintenance and repairs, and it does not meet current design standards. The tunnel is considered to be structurally deficient due to its age, the original design, and wear and tear. The tunnel is also functionally obsolete and unable to meet current and future rail demands due to the combination

of its vertical and horizontal track alignment, i.e., its grades and curves. The low-speed tunnel creates a bottleneck at a critical point in the NEC.

- The existing B&P Tunnel does not provide enough capacity to support existing and projected demands for regional and commuter passenger service along the NEC.
- The existing B&P Tunnel is not suited for modern high-speed usage due to the current horizontal and vertical track alignment, which limits passenger train speeds through the tunnel to 30 miles per hour (mph).
- The existing B&P Tunnel is a valuable resource and the disposition of the existing tunnel needs to be considered in the Project.

1. Physical Condition

The existing B&P Tunnel's two-track cross-section is a horseshoe-shaped arch with an approximate spring line width of 27 feet between the side walls and centerline height of about 21 feet. The majority of the existing two-track B&P Tunnel is supported by a multiple course brick-lined arch and masonry sidewalls. One of the existing B&P Tunnel's tracks is typically designated for northbound traffic and the other for southbound traffic. Safety refuge areas are located in the sidewalls of the tunnel. There is no physical separation of the tracks, which prohibits major improvements to the existing tunnel while in service. The existing track layout causes difficulties for maintenance and repair. Short working windows require multiple mobilizations for repairs, thus slowing progress and substantially increasing maintenance costs. Water-saturated soil beneath the tunnel is causing its floor slabs to sink, forcing Amtrak to make costly repeated repairs (NEC Infrastructure and Operations Advisory Commission, 2013). Also, drainage through the tunnel's walls, leakage from existing utility lines, poor drainage of the tunnel's invert, and insufficient clearance were noted in a prior study of the tunnel (FRA and MDOT, 2011). Most recently, the *Existing B&P Tunnel Visual Inspection* prepared for the B&P Tunnel Project provides a review of the tunnel's structural integrity, water infiltration,[1] drainage system function, railroad components, safety, and security. The inspection noted numerous issues with the physical condition of the three tunnel segments, including sections of brick and mortar loss, cracks and chips, delaminations, debris, deteriorating manholes, water infiltration, and other issues. In the long-term, the frequency and magnitude of repairs required to maintain the existing B&P Tunnel is expected to increase. This would result in greater maintenance cost and increased impacts to Amtrak, MARC, and freight operations if the existing tunnel remains in use.

2. Existing Track Alignment

The existing B&P Tunnel's grades and horizontal alignment limit train speeds, increase travel time, and impact the NEC's ability to support high-speed rail systems. A railroad's efficiency is dependent on its vertical and horizontal alignment, i.e., its grades and curves. Steep grades and the NEC's curvature, especially near Winchester Street (where the existing B&P Tunnel turns sharply at the entrance of the Gilmor Street Tunnel), prohibit high-speed service.

According to *Baltimore's Railroad Network: Challenges and Alternatives* (FRA, 2005), the NEC has "very difficult tunnel alignments" and "especially noteworthy are the restrictions imposed by the [existing] B&P Tunnel" for the roughly two miles between Mileposts 95.9 and 97.7. **Table 1** shows the maximum allowable speeds on Amtrak's NEC through Baltimore in and adjacent to the existing B&P Tunnel.

[1] Water infiltration in the existing B&P Tunnel relates to water leaking into the tunnel. This water can carry fine deposits and can leave voids behind the tunnel's liner and under slabs. The water infiltration also has the potential to prematurely age sump pumps and increase maintenance requirements and costs.

Table 1: Maximum Allowable Speeds on Amtrak's NEC through Baltimore

Route Segment	Max Speed Passenger Service	Max Speed Freight Service
Union Tunnels, north of Baltimore Penn Station	45 mph	30 mph
Existing B&P Tunnel, south of Baltimore Penn Station	30 mph	20 mph
South of existing B&P Tunnel to Baltimore Washington International (BWI) Rail Station	110 mph	50 mph or less

Note: These maximum allowable speeds are general guidelines, always subject to site- and time-specific considerations.
Source: Baltimore's Railroad Network: Analysis and Recommendations, Table 2-7 (FRA and MDOT, 2011).

Maximum allowable speed for Amtrak trains in the existing B&P Tunnel is 30 mph for passenger service and 20 mph for freight service. All trains must slow down in order to stop at Baltimore Penn Station. Trains traveling from the north must slow down to pass through the B&P Tunnel before gaining speed south of the B&P Tunnel (up to 110 mph for passenger services currently, with higher speeds expected in the future).

Southbound trains entering the existing B&P Tunnel slow for a sharp (8-degree) curve, then ascend on a mile-long 1.34 percent grade, the steepest grade on the NEC between Philadelphia and Washington, DC.

Additionally, the approach section to the tunnel at the West Baltimore MARC Station is located on a curve (referred to as Curve 381) that limits train speeds to 55 mph. Curve 381 precludes level boarding of MARC trains, as the high-level platforms on sharp curves (greater than 1 degree) require passengers to negotiate a large gap between the platform and the train car door. As this is considered to be an unsafe condition, platforms on such curves are positioned at grade. The lack of a high-level boarding platform prevents designation of the West Baltimore Station as an accessible boarding location. The need to provide ADA-compliant facilities at the West Baltimore MARC Station has been the subject of previous planning studies conducted by the Maryland Transit Administration (MTA).

3. Bottleneck in NEC Operations

The NEC is the most heavily traveled rail corridor in the United States (NEC Master Plan Working Group, 2010). According to the *NEC Infrastructure Master Plan* (Amtrak, 2010a), this rail network is a centerpiece of the transportation infrastructure that contributes to the economic vitality of the Northeast region. By linking all the major northeastern cities, it moves more than 259 million passengers and 14 million car-miles of freight per year (Amtrak, 2010a).

Due to the age of the existing B&P Tunnel and the technological advancement of the rail system in the more than 140 years since it was built, the existing B&P Tunnel limits the functionality of railroads through Baltimore and along the NEC. The existing B&P Tunnel is "a major chokepoint for intercity, commuter, and freight operations in the northeast" (Amtrak, 2010a). The tunnel creates a bottleneck in NEC operations due to its reduced travel speeds. The NEC, which includes active use of three and four tracks elsewhere, has only two tracks through the existing B&P Tunnel, which must accommodate a mixture of regional and commuter passenger trains and freight service. Therefore, FRA has determined that four tracks will be necessary to alleviate the existing bottleneck and accommodate future demands as predicted by the NEC FUTURE program[2]. The volume of trains forecasted by the NEC FUTURE program, as documented in the NEC FUTURE Tier 1 DEIS and Tier 1 FEIS, would not be accommodated without a four-track alignment through Baltimore (FRA, 2015)(FRA,

[2] NEC FUTURE is a comprehensive planning effort to define, evaluate, and prioritize long-term future investments in the NEC, from Washington, DC to Boston. The Tier 1 Draft EIS for NEC FUTURE was completed in November 2015, and the Tier 1 Final EIS was completed in December 2016. More information is available in the B&P Tunnel FEIS and the NEC FUTURE webpage at www.necfuture.com.

2016). The NEC Future Tier 1 FEIS Preferred Alternative also includes four tracks to the north and south of the B&P Tunnel along the NEC (FRA, 2016).

a. Existing Travel Time

Trip times through the existing B&P Tunnel range from 5 minutes and 48 seconds to 7 minutes and 16 seconds. As indicated in the **Table 2**, travel time is longer for northbound trains that stop at BWI Rail Station because they must slow down to diverge at the Bridge Interlocking before entering the existing B&P Tunnel. Amtrak times are measured between Baltimore Penn Station and passing block signals 993/994 (at approximately Milepost 99.2, Gwynns Falls Bridge) while MARC times are measured between Baltimore Penn Station and the West Baltimore Station stop (Milepost 98.5).

Table 2: Current Trip Times Through the Existing B&P Tunnel

Trip Direction	MARC Commuter[1]	Amtrak Regional/Intercity[2]	Acela[3]
Southbound	5 min, 48 sec	6 min, 20 sec	5 min, 52 sec
Northbound (No stop at BWI)	N/A	6 min, 5 sec	5 min, 56 sec
Northbound (Stop at BWI)	6 min, 18 sec	7 min, 16 sec	7 min, 1 sec

[1] Trainset assumed for MARC Commuter trains: HHP-8 locomotive plus 7 MARC III cars.
[2] Trainset assumed for Amtrak Regional/Intercity trains: AEM7 locomotive plus 8 Amfleet cars.
[3] Trainset assumed for Acela trains: standard Acela trainset.
Source: General Orders Timetable (Amtrak, December 2012 and 2014).

4. Operational Needs of the NEC

Three major providers use the existing B&P Tunnel: Amtrak, MARC, and Norfolk Southern (NS). The providers have documented the need for improvements along the NEC, particularly in Baltimore City and the area surrounding the existing B&P Tunnel. The following reports discuss the operational needs of the NEC, including improving the bottleneck created by the existing B&P Tunnel:

- *Baltimore's Railroad Network: Challenges and Alternatives* (FRA, 2005);
- *The Northeast Corridor Infrastructure Master Plan* (Amtrak, 2010a);
- *A Vision for High-Speed Rail in the Northeast Corridor* (Amtrak, 2010b);
- *Baltimore's Railway Network: Analysis and Recommendations* (FRA and MDOT, 2011);
- *The Amtrak Vision for the NEC* (Amtrak, 2012);
- *Critical Infrastructure Needs on the Northeast Corridor* (NEC IOAC, 2013);
- *MARC Growth and Investment Plan - Update 2013 to 2050* (MTA, 2013);
- *Washington Terminal Yard Future Operating Plans* (MARC/Amtrak 2020 and 2030 Plans) (LTK Engineering Services, 2014);
- *NEC FUTURE: A Rail Investment Plan for the Northeast Corridor* (FRA, 2015); and *NEC FUTURE Tier 1 Final EIS* (FRA 2016)
- *Baltimore Penn Station Master Plan* (Amtrak, 2015)

Generally, these studies highlight the existing B&P Tunnel as a major bottleneck along the NEC due to its deficient geometry and physical condition. The B&P Tunnel is identified as an asset reaching the end of its useful life, and an impediment to the overall speed, capacity, and reliability of the NEC. More detailed information on the operational needs of the NEC is included in the FEIS.

The Project is primarily focused on passenger rail and is not designed to specifically address future freight needs. However, the Project has been designed not to preclude freight traffic through the tunnels, including double-stack freight.

5. System Linkage and Rerouting

There are no practical detours available to route rail traffic around the existing B&P Tunnel for maintenance or in case of emergencies without rail services experiencing extensive delays. In an emergency or bottleneck situation, there is no way to route NEC traffic over the CSX rail line, or vice versa. This lack of inter-operability came to the forefront during the Howard Street Tunnel fire, when CSX had to route trains via Cleveland, Ohio (FRA and MDOT, 2011). Another constraint associated with system linkage is related to the close proximity of the Union Street Tunnel, just north of Baltimore Penn Station, and its passenger and freight restrictions with substantial elevation changes.

With no practical detour route options for the existing B&P Tunnel, a major maintenance problem in the tunnel could have a substantial impact to rail operations since the NEC does not have inherent redundancy at this location. The existing B&P Tunnel's two tracks are in the same structural envelope, which means that incidents that affect service on one track most likely affect the other track as well, reducing the possibility of single-tracking around an issue.

In order for NS to avoid using the B&P Tunnel in an emergency, closure due to maintenance, or to circumnavigate Baltimore with a Plate H (or double-stacked) train, a three-hour delay and an additional 111.6 miles are added to the route. Use of the Hagerstown route eliminates the expensive and time-consuming need to exchange high dimension cars in order for a train to be routed through Baltimore.

6. Capacity to Support Existing and Projected Demands

Roughly 50 million people, or one out of every six Americans, live in the NEC region (NEC IOAC, 2013). "Every day, over 700,000 people, nearly half of all railroad commuters nationally, travel over portions of the NEC… Overall, ridership on Amtrak's NEC services has grown 37 percent since 2000" and the demand for rail service along the NEC is at record levels (NEC IOAC, 2013). "Contributing factors to this growth include a relative rebound in population and employment growth in its major urban markets…. The NEC, however, cannot continue to accommodate this rising demand due to infrastructure that is highly constrained and in need of repair" (NEC IOAC, 2013).

Freight usage through the tunnel is limited and most freight on the NEC is routed around the existing B&P Tunnel. No CSX freight currently utilizes the B&P Tunnel due to lack of connectivity and other constraints along the NEC through Baltimore. CSX currently routes freight along a separate north-south route in Baltimore, which travels through Baltimore's Howard Street Tunnel. Amtrak has statutory and contractual obligations to permit the continued operation of NS freight trains. Currently, NS operates one train which makes a round trip through the existing B&P Tunnel daily for freight purposes, and does not travel through the tunnel during the four-hour peak evening period.

As population increases and dependency on rail transportation grows, the demand for more efficient, better rail service within the Northeast megaregion is expected to rise. This will increase the service demands for the number of passenger trains for Amtrak and MARC along the NEC and require additional capacity and improved operations throughout the Project limits.

D. Summary

The Project purpose is to address the structural and operational deficiencies of the existing B&P Tunnel and support future high-speed rail services along the NEC. The Project will improve operations along the NEC, improve passenger rail services, and support existing and future demands along the NEC. The physical condition of the existing B&P Tunnel requires that it be rebuilt or replaced within the next 10-20 years (FRA and MDOT, 2011). Not only is the structure over 140 years old, the design of the railway is unable to support higher speed trains or more passenger and freight capacity. The structural and operational deficiencies result in a transit bottleneck along the NEC in Baltimore.

According to the *Northeast Corridor Infrastructure Master Plan*, the B&P Tunnel is important not only for Baltimore, but also the entire NEC (Amtrak, 2010a). The existing B&P Tunnel is a centerpiece of the Baltimore rail network that contributes to the economic vitality of the Northeast region. The NEC Master Plan identifies the need to maintain the current NEC system in a state of good repair; integrate intercity, commuter, and freight service plans; and move the NEC forward to meet the expanded service, reliability, frequency, and trip-time improvements that are envisioned by the Northeast states and the District.

More detailed information on the B&P Tunnel Purpose and Need is included in the FEIS.

III. ALTERNATIVES

This section summarizes the alternatives analysis process, the alternatives evaluated in the DEIS and the FEIS, and the process of identifying the Preferred Alternative and Selected Alternative. It also describes the Selected Alternative. The DEIS and FEIS analyzed four alternatives, including the No-Build Alternative. This section also discusses the process by which FRA and MDOT identified the proposed Intermediate Ventilation Facility site at 900-940 West North Avenue as the preferred site for the Intermediate Ventilation Facility.

A. Alternatives Development

FRA and MDOT undertook an extensive process to identify and refine alternatives for study in the DEIS and FEIS. The alternatives development process has been documented in the *Preliminary Alternatives Screening Report, Alternatives Report,* DEIS, and FEIS documents. Refer to these reports for more detailed information on each phase of the alternatives development process leading up to this ROD.

FRA and MDOT identified the initial range of alternatives based on previous studies, including the two phases of the *Baltimore's Railroad Network Study* (FRA, 2005; FRA and MDOT, 2011) and during the preliminary alternatives development phase of the Project. A total of sixteen preliminary alternatives were identified, including Alternative 1: No-Build, Alternative 2: Restore/Rehabilitate Existing B&P Tunnel, and fourteen new location alternatives. The fourteen new location alternatives included five alternatives based on previous studies (Alternatives 3 through 7), and nine additional alternatives identified by this Project (Alternatives 8 through 16). Alternative 16 was based on public comments received at the October 29, 2014 public open house.

FRA and MDOT applied the preliminary alternatives screening process to all 16 preliminary alternatives. As a result of this initial screening process, twelve alternatives were eliminated from further study, and four alternatives were retained for further engineering development and environmental evaluation. Six of the alternatives were found to have fatal flaws because they did not meet the Purpose and Need, did not utilize existing infrastructure at Baltimore Penn Station and the Gwynns Falls Bridge, or would result in an unacceptable engineering issue that could not be reasonably avoided or solved. The remaining preliminary alternatives were evaluated based on 19 preliminary screening criteria including engineering, operational, and environmental considerations. Six preliminary alternatives were eliminated based on the preliminary screening criteria. This information was presented to the public in December 2014 in the *Preliminary Alternatives Screening Report*.

Alternatives 1, 2, 3, and 11 were carried forward from the *Preliminary Alternatives Screening Report* and underwent an additional, more detailed preliminary engineering review. As a result of the refined goals and more detailed engineering, described in the *Alternatives Report*, Alternatives 3 and 11 were each expanded to include several Options. Alternative 3 included Options A, B, and C. Alternative 11 included Options A and B.

The *Alternatives Report* evaluated and compared the alternatives in much greater detail than the *Preliminary Alternatives Screening Report*. The *Alternatives Repor*t documented the advancement of the following alternatives for evaluation in the DEIS:

- Alternative 1: No-Build,
- Alternative 3 Option A (Alternative 3A),
- Alternative 3 Option B (Alternative 3B), and
- Alternative 3 Option C (Alternative 3C).

The Alternatives Report also noted the removal of these alternatives from further consideration:

- Alternative 2,
- Alternative 11 Option A, and
- Alternative 11 Option B.

Alternative 2 was removed because it would not improve travel times over existing conditions, could only accommodate two tracks, and would result in substantial community and rail service disruption. In particular, it would require complete cessation of rail service along the NEC corridor during construction. Alternative 2 would therefore not meet the Project's Purpose and Need.

Alternative 11 Options A and B would both meet the Project Purpose and Need. However, the overall impacts of the alternatives would not result in commensurate benefits compared to the alternatives retained for consideration in the DEIS and FEIS. Furthermore, Alternative 11 Option B would result in less operational flexibility and high construction cost relative to other alternatives. More detailed information on the elimination of Alternative 2 and Alternative 11 Options A and B is available in the *Alternatives Report* and the FEIS.

B. Alternatives Considered in the DEIS and FEIS

1. Build Alternatives

Four alternatives were evaluated in the DEIS: Alternative 1: No-Build, Alternative 3A, Alternative 3B, and Alternative 3C (the build alternatives). The DEIS included an in-depth examination of existing conditions and potential environmental impacts resulting from each of the four DEIS alternatives.

Subsequent to the publication of the DEIS, FRA and MDOT refined Alternatives 3A, 3B, and 3C to reduce potential social, cultural, and environmental impacts and address community concerns. These refined alternatives were evaluated in the FEIS.

FRA, in coordination with MDOT and Amtrak, identified Alternative 3B as the Preferred Alternative for the B&P Tunnel Project in the FEIS. FRA and MDOT identified the Preferred Alternative based on the following: an assessment of how the Preferred Alternative meets the Project Purpose and Need; an assessment of rail operations, engineering, transportation, cost, and construction; an assessment of all environmental impacts; and all public and agency comments received. In identifying the Selected Alternative, FRA considered the No-Build along with Alternatives 3A, 3B, and 3C. The three build alternatives are briefly described below. More detailed descriptions of the build alternatives are included in the FEIS.

a. Alternative 3A

Alternative 3A would result in a total travel distance of 3.7 miles between Baltimore Penn Station and Gwynns Falls Bridge (average of the four tracks). Alternative 3A would follow the existing NEC mainline tracks in the Jones Falls Valley under the Howard Street Bridge to just before North Avenue, where the alternative diverges from the existing track alignment. The alignment would continue above ground until the north portal located at the retaining wall next to the MTA North Avenue LRT Station. The alignment would travel through an existing retaining wall, adjacent to the LRT station, to begin its descent below ground.

Alternative 3A would continue below ground in a gradual arc for 1.9 miles, traversing below primarily residential city blocks in the neighborhoods of Reservoir Hill, Penn North, Sandtown-Winchester, Bridgeview/Greenlawn,

Midtown-Edmondson, and Penrose/Fayette. Alternative 3A would include a south portal located within the existing P. Flanigan & Sons asphalt plant property, roughly a third of a mile west of the existing B&P Tunnel south portal. The cut-and-cover and open-cut sections would be located between the P. Flanigan & Sons property and Lafayette Avenue, with some additional at-grade track work located between Lafayette and Edmondson Avenues. Further at-grade track work within Amtrak right-of-way would be located between Mulberry Street and Gwynns Falls Bridge. No modifications to the West Baltimore MARC Station would be required.

b. Selected Alternative (Alternative 3B)

The Selected Alternative (Alternative 3B) was developed to retain the basic conceptual alignment of Alternative 3A while improving travel speeds near the south portal. The Selected Alternative differs from 3A primarily in the location of the south portal and the southern tie-in with the existing tracks. The south portal would be shifted southeast by roughly 600 feet relative to Alternative 3A. The Selected Alternative would result in a total travel distance of 3.7 miles between Baltimore Penn Station and Gwynns Falls Bridge (average of the four tracks).

The Selected Alternative would follow the existing railroad mainline track in the Jones Falls Valley under the Howard Street Bridge to just before North Avenue, where the alternative would leave the existing track alignment to begin its gradual arc. The alignment would continue above ground until it reaches its north portal located at the retaining wall next to the MTA North Avenue LRT Station. The alignment would travel through an existing retaining wall adjacent to the LRT rail station to begin its descent below ground.

The Selected Alternative would continue below ground in a gradual arc for 2.0 miles, traversing below primarily residential city blocks in the neighborhoods of Reservoir Hill, Penn North, Sandtown-Winchester, Bridgeview/Greenlawn, Midtown-Edmondson, and Penrose/Fayette. The Selected Alternative would include a south portal located southeast of the P. Flanigan & Sons asphalt plant, and southeast of the existing NEC tracks, approximately 200 feet east of the Alternative 3A south portal. The cut-and-cover and open-cut sections would be located adjacent to the existing NEC, between the proposed south portal and Lafayette Avenue. The alignment would continue on a new aerial structure over Franklin and Mulberry Streets, then return to the existing NEC right-of-way near Warwick Avenue. At-grade track work within Amtrak right-of-way would occur from near Edmondson Avenue to just south of the Gwynns Falls Bridge. The West Baltimore MARC Station would be relocated slightly west of its current location to align with the new tracks, and the reduced curvature would allow for reconstructing with ADA accessible high-level platforms.

c. Alternative 3C

Similar to the Selected Alternative, Alternative 3C was developed to retain the basic conceptual alignment of Alternative 3A while improving travel speeds near the south portal. Alternative 3C differs from 3A and the Selected Alternative primarily in the location of the south portal and the southern tie-in with existing tracks. The south portal is shifted northwest by roughly 300 feet relative to Alternative 3A. Alternative 3C would result in a total travel distance of 3.8 miles between Baltimore Penn Station and Gwynns Falls Bridge (average of the four tracks).

Alternative 3C follows the existing railroad mainline tracks in the Jones Falls Valley under the Howard Street Bridge to just before North Avenue, where the alternative diverges from the existing alignment. The alignment continues above ground until it reaches its north portal located at the retaining wall next to the MTA North Avenue LRT Station. The alignment would travel through an existing retaining wall adjacent to the LRT station and begin its descent below ground.

Alternative 3C continues below ground in a gradual arc for 2.2 miles. The alignment traverses below primarily residential city blocks in the neighborhoods of Reservoir Hill, Penn North, Easterwood, Bridgeview/Greenlawn, Midtown-Edmondson, and Penrose/Fayette. Alternative 3C would include a south portal located within the P. Flanigan & Sons asphalt plant, just south of the athletic fields at Carver Vocational-Technical High School, and

roughly a third of a mile west of the existing B&P Tunnel south portal. The cut-and-cover and open-cut sections would be located along the western edge of the P. Flanigan & Sons property, and travel south in a cut-and-cover section, parallel to the existing Amtrak right-of-way near Lafayette Avenue. The alignment would continue in an open-cut section shifted west of the NEC, on a new aerial structure over Franklin and Mulberry Streets, then return to the existing NEC right-of-way near Warwick Avenue. At-grade track work within Amtrak right-of-way would occur from near Edmondson Avenue to just south of Gwynns Falls Bridge.

2. Ventilation Facilities

Each of the build alternatives would require three ventilation facilities to ensure proper ventilation of the proposed tunnels: one North Ventilation Facility located at or near the north portal; one South Ventilation Facility near the south portal; and one Intermediate Ventilation Facility located at street level, connected to the tunnel bores by a vertical shaft and connecting tunnel (plenum), splitting the proposed tunnel into two unequal lengths. For each build alternative, the North Ventilation Facility would be located at a site approximately 300-600 feet from the proposed north portal, at what is currently a Baltimore City DOT (BCDOT) maintenance facility. The South Ventilation Facility would be located atop the south portal cut-and-cover section.

As part of the preliminary engineering, FRA and MDOT identified an initial Area of Consideration for the Intermediate Ventilation Facility of each build alternative. From an engineering standpoint, this area was developed to assist with identifying the ideal Intermediate Ventilation Facility location, while allowing for flexibility in the specific site proposed to minimize community impacts. During the development of the DEIS, FRA and MDOT identified and presented a site within the initial Area of Consideration, located at the corner of Whitelock Street and Brookfield Avenue. However, further analysis of the potential community, land use, and historic property impacts resulting from use of the site suggested that the Intermediate Ventilation Facility would be incompatible with the surrounding land uses and prompted evaluation of additional sites. A total of nine potential additional sites for the Intermediate Ventilation Facility were identified in the DEIS. Substantial community concerns related to the Whitelock Street site were received during the DEIS public hearings and comment period.

The FEIS included more detailed analysis of two Intermediate Ventilation Facility sites along North Avenue in Reservoir Hill (850 West North Avenue and 900-940 West North Avenue) along with the site at Whitelock Street and Brookfield Avenue. **Table 3** summarizes the key differences between the alternatives considered. Based on this analysis and other information in the FEIS, FRA identified the 900-940 West North Avenue site as the preferred site based on consideration of impacts, costs, and community input. More detail on the potential ventilation facilities sites is included in the DEIS and FEIS.

Table 3: Intermediate Ventilation Facility Sites Comparison

Site	900-940 West North Avenue	850 West North Avenue	Whitelock Street at Brookfield Avenue
Cost	$590 Million	$820 Million	$325 Million
Land Use and Neighborhoods	• 7 Business Displacements • Commercial/residential uses nearby • Adjacent to Elementary School	• Vacant housing complex • Commercial/residential uses nearby • Adjacent to Elementary School	• Whitelock Community Farm • Residential uses nearby • 3 blocks away from Elementary School
Cultural Resources	• 1 historic building demolition • Periphery of Reservoir Hill Historic District	• No historic building demolitions • Periphery of Reservoir Hill Historic District	• No historic building demolitions • Interior of Reservoir Hill Historic District

Site	900-940 West North Avenue	850 West North Avenue	Whitelock Street at Brookfield Avenue
Natural Resources	17 street trees and 10 landscaped trees	4 street trees and 20 landscaped trees	13 street trees and 22 landscaped trees
Hazardous Materials (HM)	8 sites in vicinity	8 sites in vicinity	10 sites in vicinity
Air Quality	2.9 ppb NO_2 – No Impact above NAAQS	2.9 ppb NO_2 – No Impact above NAAQS	2.9 ppb NO_2 – No Impact above NAAQS
Operational Noise	45 dBA	45 dBA	45 dBA
Construction Vibration	0.07 to 0.4 inches per second – No damage to old residential buildings in poor condition	0.07 to 0.4 inches per second – No damage to old residential buildings in poor condition	0.07 to 0.4 inches per second – No damage to old residential buildings in poor condition
Construction	Drill and blast – approximately 650-foot plenum length	Drill and blast – approximately 1,115-foot plenum length	Drill and blast – approximately 380-foot plenum length

FRA and MDOT identified the 900-940 West North Avenue location in the FEIS as the preferred site due to the greater impact of constructing a larger plenum and the subsequent greater cost ($230 million) associated with 850 West North Avenue. A longer connection results in substantially higher cost and changes to the ventilation system such as an increase in the size of the ventilation plenum cross-section; a greater number of ventilation fans; increased ventilation fan horsepower and associated electrical power; and reduced effectiveness of piston-action ventilation, requiring the fans to run in normal operations more frequently. Furthermore, a greater amount of drill-and-blast construction leading to more severe construction-related impacts would result from the 850 West North Avenue site compared to 900-940 West North Avenue. An Intermediate Ventilation Facility at the 900-940 West North Avenue site will better fit the existing land use context compared to the Whitelock Street location, resulting in less community impact. The 900-940 West North Avenue site is therefore included in the evaluation of environmental impacts of the build alternatives in the FEIS and summarized in this ROD.

C. Environmentally Preferable Alternative

CEQ regulations implementing NEPA require that an agency identify the alternative considered to be environmentally preferable (40 C.F.R. 1505.2). CEQ's "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations" describes the "environmentally preferable alternative" as "the alternative that will promote the national environmental policy as expressed in the NEPA, Section 101."[3] FRA made its determination by considering each alternative's impacts against the national environmental policy goals listed in Section 101:

- Fulfilling the responsibilities of each generation as trustee of the environment for succeeding generations;
- Assuring for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings;
- Attaining the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;

[3] Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 46 Federal Register 18026 (March 23, 1981) ("Ordinarily, this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative that best protects, preserves, and enhances historical, cultural, and natural resources.")

- Preserving important historic, cultural and natural aspects of our national heritage and maintaining, wherever possible, an environment that supports diversity and variety of individual choice;
- Achieving a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and
- Enhancing the quality of renewable resources and approaching the maximum attainable recycling of depletable resources.

FRA weighed and balanced the environmental effects associated with the build alternatives as well as those associated with the No-Build Alternative. Considering these factors, FRA determined that the adverse environmental impacts associated with the Selected Alternative are less substantial than the impacts associated with Alternative 3A, Alternative 3C, and the No-Build Alternative. Although the No-Build Alternative and Alternative 3A would have fewer near-term impacts to the physical environment, including historic, cultural, or natural resources, than the Selected Alternative, the Selected Alternative would have substantial beneficial impacts on transportation that outweigh the physical impacts of constructing the Selected Alternative. Specifically, the Selected Alternative would improve travel times, reliability and safety, and capacity associated with regional and high-speed rail service and would allow for more high-speed rail travel. These benefits would promote fulfilling the responsibilities of each generation as trustee of the environment for succeeding generations and achieving a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities by enhancing sustainable travel options.

In contrast with the Selected Alternative, the No-Build Alternative would not meet the Purpose and Need of the Project as described in **Section II**. The No-Build Alternative would not reduce travel times, accommodate existing and projected travel demand, eliminate impediments along the NEC, or provide operational reliability. As discussed in the next section, Alternative 3A would less effectively meet the Purpose and Need compared to the Selected Alternative and therefore would not have the same beneficial transportation impacts as the Selected Alternative. Finally, although Alternative 3C would address the Purpose and Need to a similar degree as the Selected Alternative and therefore would have the same beneficial impacts as the Selected Alternative, the overall environmental impacts from Alternative 3C are more severe than the Selected Alternative and are not outweighed by these beneficial impacts on transportation.

D. Selection of Alternative 3B

FRA selects Alternative 3B (referred to as the Preferred Alternative in the FEIS) for the B&P Tunnel Project. Alternative 3B (Selected Alternative) is selected because of its superior ability to meet the Project's Purpose and Need while minimizing environmental impacts. When compared to each of the other alternatives evaluated in the DEIS and FEIS, the Selected Alternative provides a superior balance of benefits and impacts.

The Selected Alternative is superior to the No-Build because it effectively meets the Project's Purpose and Need. While there would be no environmental impacts resulting from the No-Build scenario, the alternative would not address pressing infrastructure issues on Amtrak's NEC. The Selected Alternative will address every component of the Project Purpose and Need.

Alternative 3A would less effectively meet the overall Project Purpose and Need compared to the Selected Alternative. The Selected Alternative will reduce travel time through the B&P Tunnel and along the NEC as a result of improved alignment geometry. It will also include ADA-accessible, high-level platforms at the West Baltimore MARC Station in its current location, which would not be possible under Alternative 3A. Thus, the Selected Alternative will better accommodate existing and projected travel demand for intercity and commuter passenger services, and will eliminate an impediment to existing and projected operations along the NEC in accordance with the Purpose and Need.

Alternative 3C would meet the stated Project Purpose and Needs to a similar degree as the Selected Alternative. When all of the impacts in the FEIS are taken into account, despite the advantage of having fewer residential

impacts, the overall environmental impacts from Alternative 3C are more severe than the Selected Alternative. The impacts to individually eligible historic properties that would occur under Alternative 3C are particularly severe. Additionally, Alternative 3C is the most expensive of the three build alternatives considered. Furthermore, it would impact the P. Flanigan & Son Asphalt plant, a major local employer.

FRA's decision reflects the balancing of different considerations including environmental and operational factors, as well as community and other stakeholder input. FRA carefully considered the potential adverse and beneficial environmental and community impacts that could result from the selection of the alternatives considered. In addition, FRA's decision is consistent with its obligation under Section 4(f) to protect land from publicly-owned parks, recreational areas, wildlife and waterfowl refuges, or historic sites on public or private land.

The Selected Alternative will be advanced to final design and construction should funding become available. Ongoing mitigation efforts and coordination with agencies and the public will proceed based on the Selected Alternative alignment, and mitigation measures included in this ROD will address the impacts resulting from the Selected Alternative.

The 900-940 North Avenue Intermediate Ventilation Facility location is recommended in the FEIS and selected in this ROD. The 850 West North Avenue site would result in greater impact from constructing a larger plenum, and the subsequent greater cost compared to the 900-940 West North Avenue site. The Whitelock Street at Brookfield Avenue site would be less compatible with existing land uses resulting in greater community impact. The 900-940 West North Avenue site is therefore included in the evaluation of environmental impacts of the build alternatives in the FEIS and summarized in this ROD.

E. Description of the Selected Alternative

This section provides a detailed description of the Selected Alternative, including detail on the alignment, ventilation facilities, emergency egress, impact to the West Baltimore MARC Station, associated roadway and bridge improvements, major utilities to be reconstructed, construction methods to be employed, and a capital cost estimate.

1. Overview

The Selected Alternative is 3.67 miles in length from the Amtrak Gwynns Falls Bridge to Baltimore Penn Station. From the south, the Selected Alternative begins along the same horizontal and vertical alignment as the existing Amtrak tracks on the Gwynns Falls Bridge, traverses the same alignment as the existing Amtrak tracks, crosses over Mulberry and Franklin Streets on a new railroad bridge, and then begins to descend into an open-cut section. The open-cut section then transitions into the south tunnel portal west of Payson Street between Riggs Avenue and Mosher Street. The Selected Alternative then proceeds for 2.00 miles in tunnel in a generally semi-circular alignment returning to surface-level at the north tunnel portal east of I-83 (Jones Falls Expressway) and immediately east of the Baltimore Central Light Rail alignment. The Selected Alternative then proceeds into the Baltimore Penn Station area at the same elevation as the existing tracks immediately north of Penn Station. A more detailed description of the alignment of the Selected Alternative follows in **Section III.E.2**. The Selected Alternative also includes a newly constructed West Baltimore MARC Station, described in further detail in **Section III.E.5**.

A graphic depiction of the overall horizontal alignment of the Selected Alternative, as well as a profile showing the vertical alignment of the Selected Alternative is provided on **Figure 2**.

The Selected Alternative includes three ventilation facilities required to meet current industry safety standards. More information on the need for ventilation facilities is included in **Section III.D.3**. Ventilation facilities would be located at the south tunnel portal, near the north tunnel portal, and at the 900-940 West North Avenue Intermediate Ventilation Facility site.

The Selected Alternative consists of four new tracks. For the tunnel portion of the alignment, each of the tracks will be in a new, separately-bored tunnel. The four tracks will meet the long-term rail passenger needs on the NEC and provide increased reliability for passenger rail operations for both Amtrak and MARC. The Selected Alternative will improve travel time by 2 minutes and 31 seconds for Amtrak trains and 1 minute 49 seconds for MARC trains, as compared to existing conditions and the No-Build Alternative.

Under the Selected Alternative, Amtrak will continue to own the existing B&P Tunnel and existing right-of-way and track outside the existing tunnel, including right-of-way not specifically needed for the Selected Alternative alignment. The existing tunnel would be closed and reserved for potential future rail transportation use.

The capital cost estimate to construct the Selected Alternative is $4.52 billion in escalated dollars, assuming construction completion in 2025. This capital cost estimate includes proposed mitigation and the selected Intermediate Ventilation Facility site. The cost increased from the preliminary capital cost estimates in the DEIS as a result of refinements to the alternative, the relocation of the Intermediate Ventilation Facility site, and mitigation commitments. A more detailed breakdown of the capital cost estimate is located in **Section III.E.9**.

2. Alignment

Figure 2 depicts the Selected Alternative alignment. **Appendix A** and **Appendix C** include detailed maps and plan and profile drawings for the Selected Alternative. The plan drawings show the centerline locations of each of the four tracks, track geometry, areas of open cut, cut-and-cover areas, and tunnel portal locations.

a. Gwynns Falls Bridge to Warwick Avenue

The Selected Alternative alignment meets the existing four tracks of the Amtrak NEC at both the same horizontal and vertical location south of the Gwynns Falls Bridge. As the alignment proceeds north, it crosses over the Gwynns Falls and Baltimore Street on an existing bridge. As the alignment proceeds north, the horizontal location of the four tracks is in the same location as the existing tracks, but the elevation gently rises to one to two feet above the existing tracks. The alignment crosses over Franklintown Road and Warwick Avenue on reconstructed four-track railroad bridges to accommodate bridge interlocking on an embankment, as opposed to the interlocking on the Gwynns Falls Bridge.

b. Warwick Avenue to Franklin Street

After crossing Warwick Avenue, the alignment begins to shift to the west of the existing alignment and crosses Mulberry Street and Franklin Street on a new bridge structure. At this point, the alignment is approximately 100 feet west of the existing alignment. This change in horizontal alignment creates a much flatter curve compared to the existing Curve 381, resulting in a speed increase and the ability to have a high-level platform at a newly constructed West Baltimore MARC Station.

c. Franklin Street to South Tunnel Portal

After crossing Franklin Street, the alignment begins to transition into the tunnel portion of the Selected Alternative. This portion of the alignment is in an open-cut section that crosses under Edmondson Avenue and Lafayette Avenue to the Tunnel Portal west of Payson Street between Riggs Avenue and Mosher Street. In this portion of the Selected Alternative, the horizontal alignment shifts from west of the existing tracks to east of the existing tracks, crossing the existing tracks just north of Edmondson Avenue.

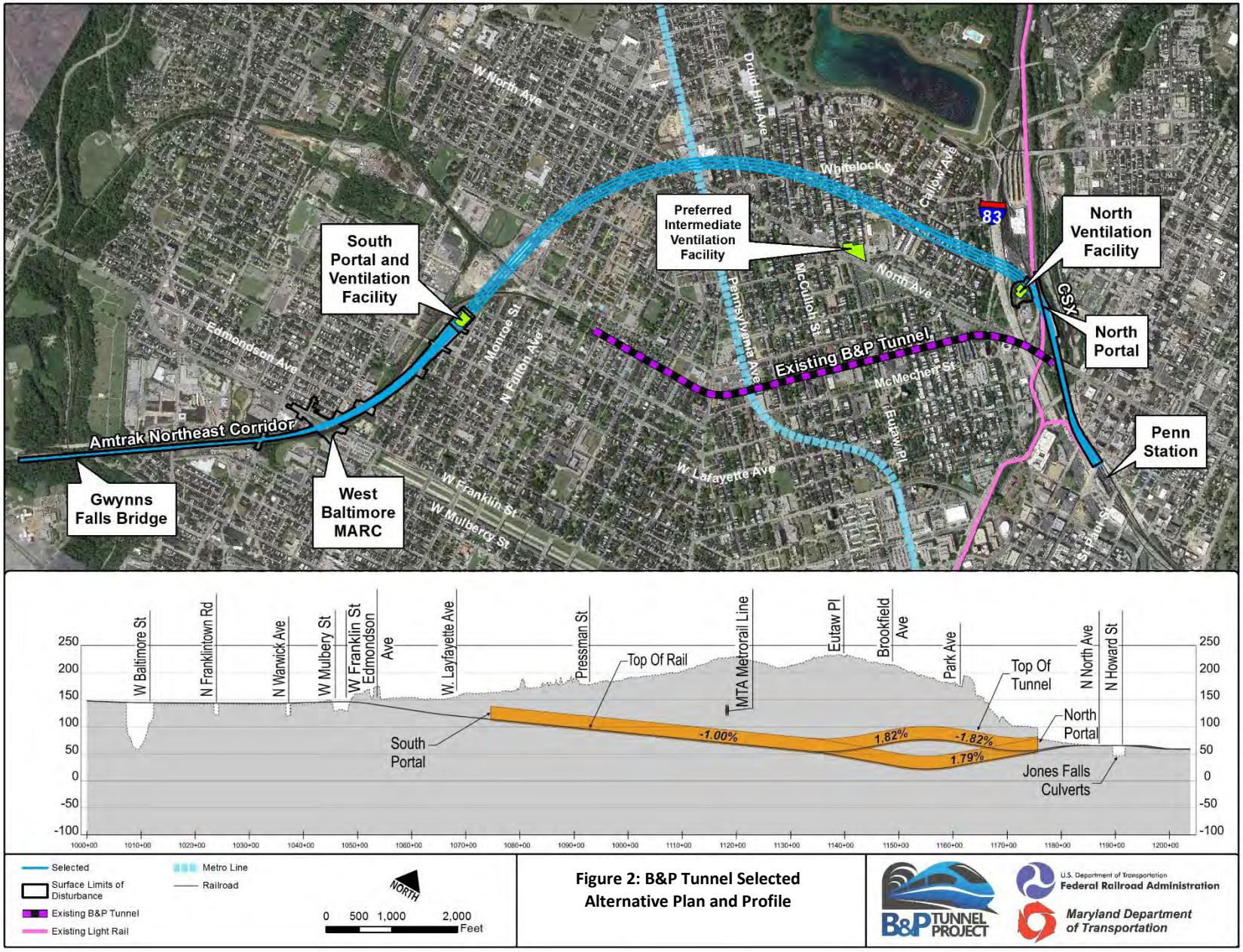


Figure 2: B&P Tunnel Selected Alternative Plan and Profile

d. Tunnel Portion

The tunnel portion of the Selected Alternative is 2.00 miles in length in a generally semi-circular alignment, running between the south and north portals. From the south portal, the tunnel alignment traverses under the property of P. Flanigan and Sons Asphalt Plant, and then predominantly under the residential communities of Penrose/Fayette, Midtown-Edmondson, Bridgeview/Greenlawn, Easterwood, Penn North, and Reservoir Hill.

The depth of the tunnel at any point relative to the existing ground elevation can be viewed in the profile drawings in **Appendix C**. The depth of the tunnel is not at a constant number of feet below ground as the existing ground is not flat but constantly changes in elevation. The maximum depth of the tunnel is approximately 150 feet from top of the tunnel to existing ground elevation. For a majority of the tunnel length, the distance between the top of the tunnel and existing ground elevation is in the range of 100 to 150 feet. The tunnel must also pass under the Baltimore Metro tunnel in the vicinity of Pennsylvania Avenue.

e. North Portal to Penn Station

The tunnel emerges at the north portal east of I-83 and immediately east of the existing MTA Light Rail line. After leaving the north portal area, the Selected Alternative crosses under a CSX bridge, under the North Avenue bridge, and under the Howard Street bridge to merge with existing tracks adjacent to and immediately north of Penn Station.

3. Ventilation Facilities

The Selected Alternative requires two ventilation zones to meet the capacity and operational performance required for train operations. The proposed tunnels will be approximately two miles long, and projected NEC FUTURE train demand and headway cannot be met with a single ventilation zone tunnel (FRA, 2015). Current industry standards in the National Fire Protection Association (NFPA) 130 dictate that only one train can be permitted in a ventilation zone at a time. Since the ventilation network works as a system (pushing or pulling air depending on the needs of a particular situation), the two ventilation zones require three ventilation facilities. The Selected Alternative therefore includes one ventilation facility at each end of the tunnel and one ventilation facility at an intermediate point, thereby dividing the tunnel into two ventilation zones.

The interface between the two ventilation zones must be located at the point that balances travel time in each ventilation zone (considering both directions). The ventilation zone interface is not in the geographic center of the tunnel alignment due to asymmetrical curvature and grades, trains entering the tunnel at differing speeds depending on their direction of travel, and braking distances.

For the Selected Alternative:

- The South Ventilation Facility will be integrated into the south tunnel portal area, located north of Mosher Street and west of North Payson Street.
- The Intermediate Ventilation Facility will be at 900-940 West North Avenue. The Intermediate Ventilation Facility Site location is shown on **Figure 3**.
- The North Ventilation Facility will be located west of the north tunnel portal in an area that is part of the North Avenue Interchange with I-83. The parcel is bounded by I-83 and the northbound off-ramp from I-83 to North Avenue. Currently, the site is partly occupied by Baltimore City maintenance facilities. The North Ventilation Facility will occupy undeveloped land within the parcel.

Figure 3: Selected Intermediate Ventilation Facility Location

Each of the three ventilation facilities would also serve as an essential Life/Safety component of the Selected Alternative to include passenger and emergency responder egress and ingress in the case of emergencies. Each facility includes an above-ground structure housing fans and ancillary equipment, operations and control equipment, fire protection equipment, silencers and dampers, ductwork, and emergency access/egress for the tunnels. Exhaust will be directed vertically from the ventilation buildings to maximize dispersion and distance from any receptors so as to facilitate compliance with federal air quality standards, and to minimize the visual impact of the ventilation buildings on the surrounding community. The site upon which the Ventilation Facility is placed will also include parking for employees, a loading dock, and site landscaping. These facilities are not yet designed and decisions have not been made as to architectural finish or final layout of the sites. For informational purposes, and to provide a sense of size, scale, and aesthetics, representative graphics have been included in the FEIS and this ROD. The approximate dimensions for the Ventilation Facilities are shown in **Table 4.** Representative site plans for the North, Intermediate, and South Ventilation Facilities are included in **Figure 4**, **Figure 5**, and **Figure 6**. These are included here as examples of potential site layouts and will be revised during final design.

Table 4: Intermediate Ventilation Facility Dimensions

Ventilation Facility	Building Footprint Length	Building Footprint Width	Building Height (above grade)	Chimney Height (above grade)
South	220 ft.	190 ft.	40 ft.	55 ft.
Intermediate	220 ft.	110 ft.	45 ft.	60 ft.
North	175 ft.	145 ft.	45 ft.	50 ft.

Figure 4: Representative Site Layout for Intermediate Ventilation Site at 900-940 W. North Ave.

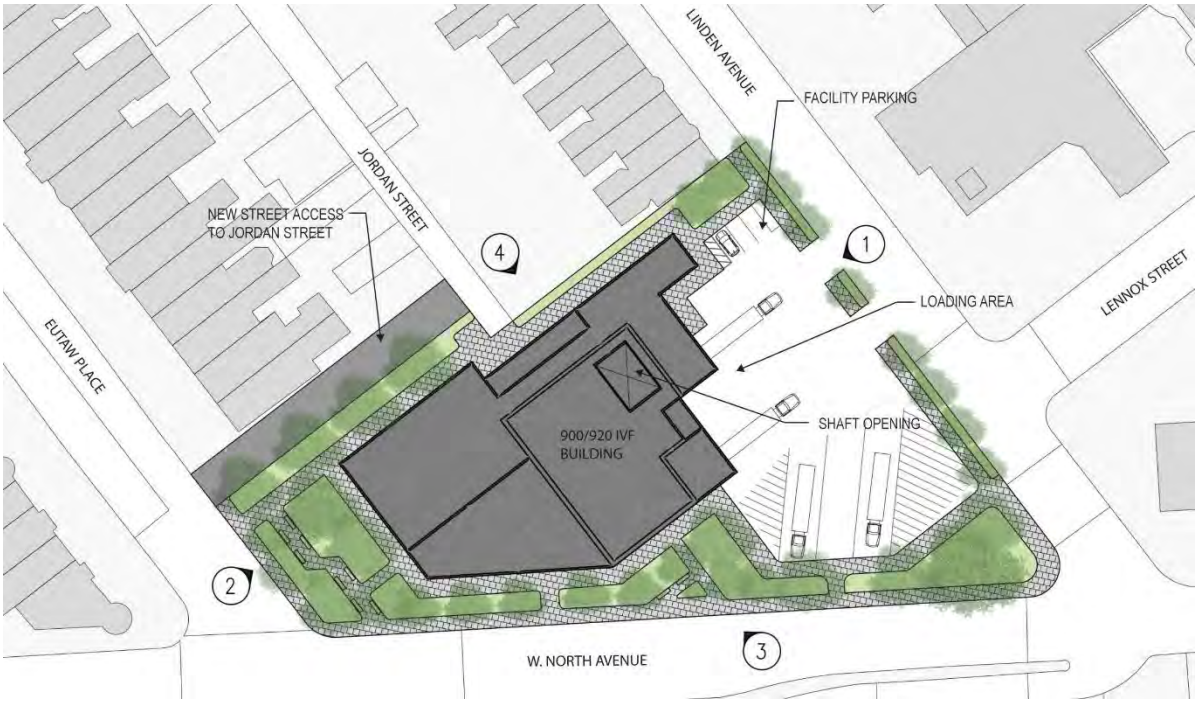


Figure 5: Proposed Location and Representative Site Plan for the South Ventilation Facility

Figure 6: Proposed Location and Representative Site Plan for the North Ventilation Facility

The 900-940 West North Avenue site is comprised of three real estate parcels:

- 900-918 West North Avenue, which includes the Sudsville Laundry and the Linden Bar & Liquor store;
- 920-940 West North Avenue, which includes the Always Learning Daycare Center; Metropolitan OB GYN Associates; Icetech Inc.; LinkiT, LLC; and Total Health Care. There is potential for expansion of the Health Care facilities; and
- 1000 Linden Avenue, which includes a parking lot.

Since the Intermediate Ventilation Facility will not be directly above or adjacent to the train tunnels, it must be connected by an underground air passage known as a plenum. The plenum for the Intermediate Ventilation Facility location at 900-940 West North Avenue is shown in **Figure 7.**

The plenum will require a cross-sectional area of 1,400 square feet to accommodate the air flow required. The shape of the plenum will likely be horseshoe shaped with a flat bottom. An egress/access corridor about 9 feet high by 8 feet wide and a utility corridor, also 9 feet high by 8 feet wide, will be incorporated into the ventilation plenum tunnel.

4. Emergency Egress

The Selected Alternative must be designed and constructed in compliance with all current standards relative to Fire Life and Safety, which includes compliance with the NFPA 130. Emergency access/egress for pedestrians must be accomplished via emergency exits no farther than 2,500 feet apart or cross passages between tunnels every 800 feet or less, or in some situations, a combination of both. Under the Selected Alternative, three locations will provide for emergency egress to the surface, working with cross passages in the tunnels. Emergency egress to ground level will be provided at the South Ventilation Facility, at the Intermediate Ventilation Facility, and at the North Ventilation Facility. Additionally, an egress tunnel located parallel to the main tunnel bores will provide an egress passage from an egress cavern located between the Intermediate Ventilation Facility and the north portal. This egress tunnel will connect to the egress corridor incorporated into the Intermediate Ventilation Facility air plenum tunnel, as shown in **Figure 8**.

5. West Baltimore MARC Station

The Selected Alternative will improve the existing West Baltimore MARC Station to incorporate high-level platforms and full ADA accessibility.

The existing West Baltimore MARC Station is located on the existing NEC south of the existing B&P tunnel. The station is located on an embankment between the two bridges which cross over Franklin and Mulberry Streets. The NEC track at this location is on a curve designated by Amtrak as Curve 381. Due to the existing geometry of Curve 381, the West Baltimore MARC Station platforms are low level, which means the platform is lower than the floor of the rail car. If the existing platforms were raised to be high level, there would be unsafe gaps between the platform and the floor of rail cars, creating an unacceptable safety hazard and lack of compliance with current design standards. The existing low-level platforms do not meet ADA design standards, but the station continues to operate because it was constructed prior to those standards. The low-level platforms also have an impact on the amount of time needed to board and alight passengers to the MARC trains, increasing this time substantially compared to high-level platforms. This boarding and alighting time also affects overall MARC train service reliability.

Figure 7: Ventilation Plenum (900-940 West North Ave.)

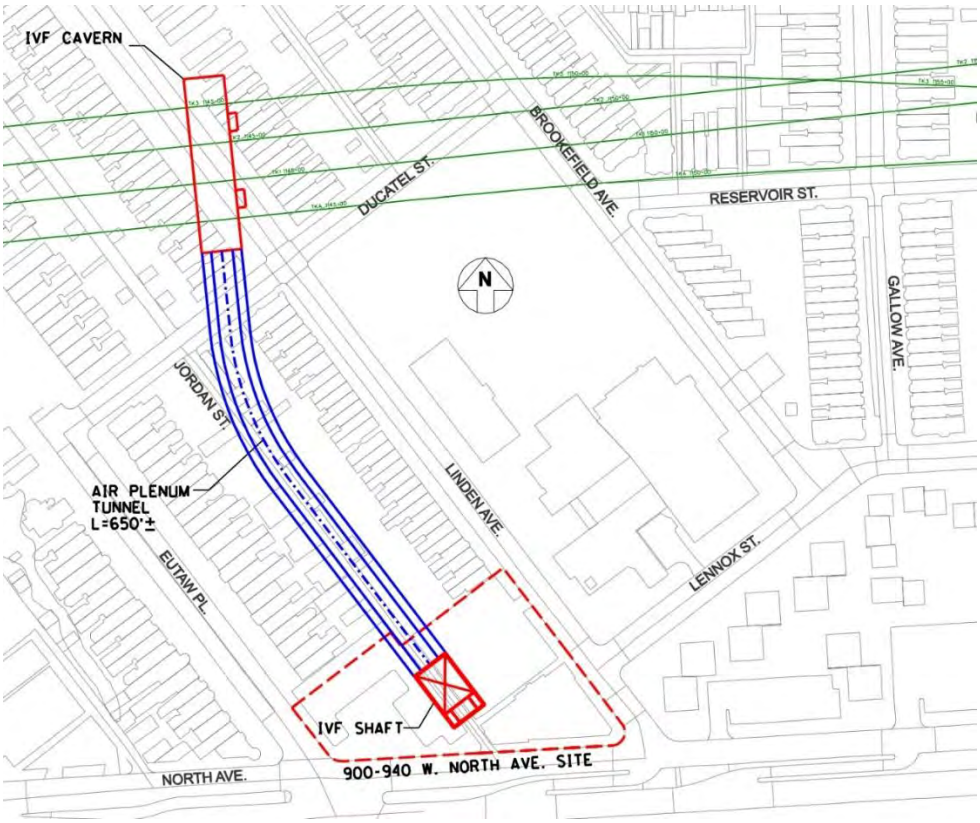
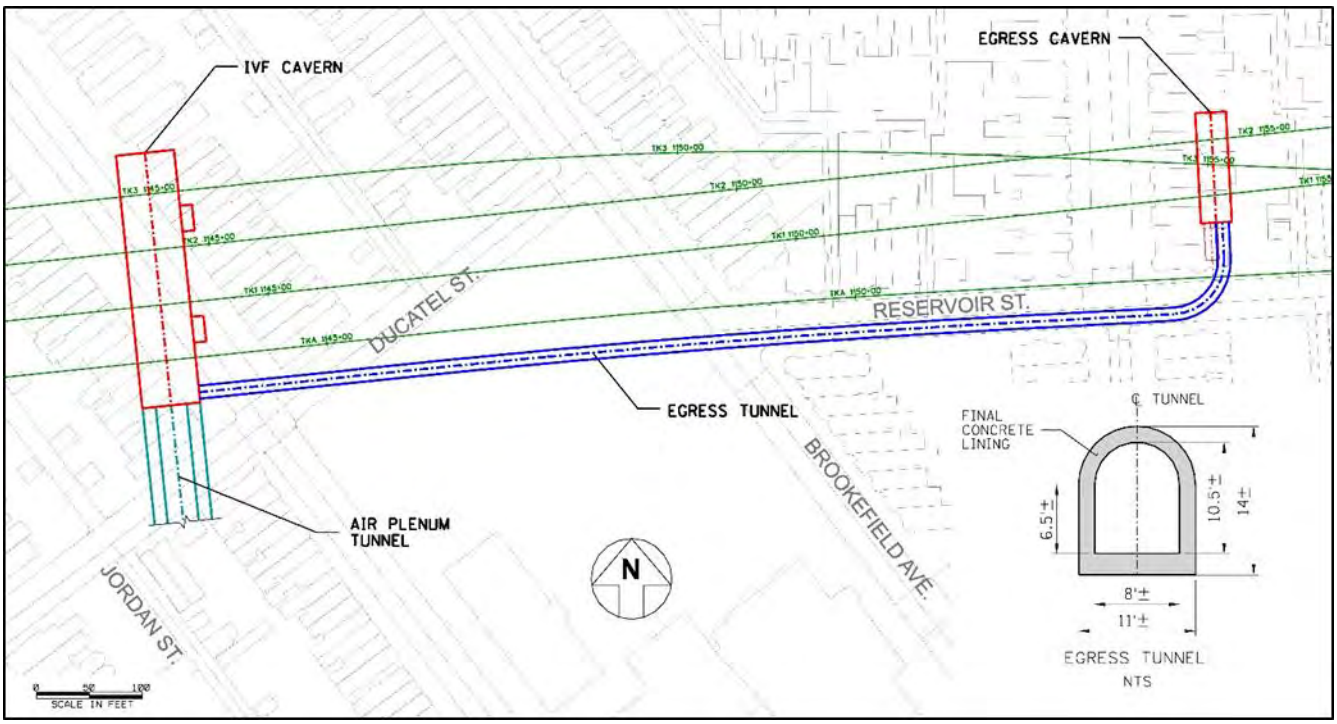


Figure 8: Egress Tunnel



The Selected Alternative will create a new track alignment in the MARC Station area which will flatten the curve in the MARC Station area and shift the alignment approximately 100 feet to the west (see **Figure 9**). This shift results in the opportunity to construct a new West Baltimore MARC Station that can accommodate high-level platforms, thereby meeting ADA standards and allowing for faster, more efficient boarding and alighting with MARC trains. The new station can also continue to be strategically located near the existing MARC Station parking and near MTA bus service that runs along Franklin and Mulberry Streets.

In addition to the high-level platforms, the Selected Alternative will include construction of other MARC Station features to incorporate ADA compliance, such as wheelchair accessible vertical pedestrian connections to and from the elevated new accessible station and the surface. In general, the new MARC Station will be constructed to replace the components of the existing MARC station. The Selected Alternative will also include enhancements to the station such as platform canopies, public art, and security lighting as part of the mitigation efforts.

6. Roadway

The construction of the Selected Alternative will require the reconstruction of several roadways or portions of roadways. These roadway modifications are required to accommodate the relocation of the NEC under the Selected Alternative, utility relocations, and changes to the elevation of the NEC where it is crossed by existing roadways. The roadway modifications include:

- Warwick Avenue between Franklin Street and Lexington Street;
- Franklin Street between Warwick Avenue and Smallwood Street;
- Mulberry Street between Warwick Avenue and Smallwood Street;
- Wheeler Avenue between Franklin Street and Edmondson Ave;
- Lauretta Ave at the intersection with Wheeler Avenue;
- Bentalou Street south of Lauretta Avenue;
- Lanvale Street between Payson Street and NEC;
- Pulaski Street north of Rayner Avenue; and
- Mosher Street between Payson Street and NEC.

The Selected Alternative will also require reconstruction of bridges including:

- Edmondson Avenue bridge over NEC;
- Lafayette Avenue bridge over NEC; and
- NEC Bridge over Franklintown Road.

7. Utilities

The construction of the Selected Alternative requires the relocation of many utilities. Additional utilities requiring relocation may be identified during final design and construction. The largest utilities to be relocated include:

- Payson Street Inverted Siphon; and
- BGE 115 kV cable in Jones Falls Tunnel (84” diameter liner plate tunnel).

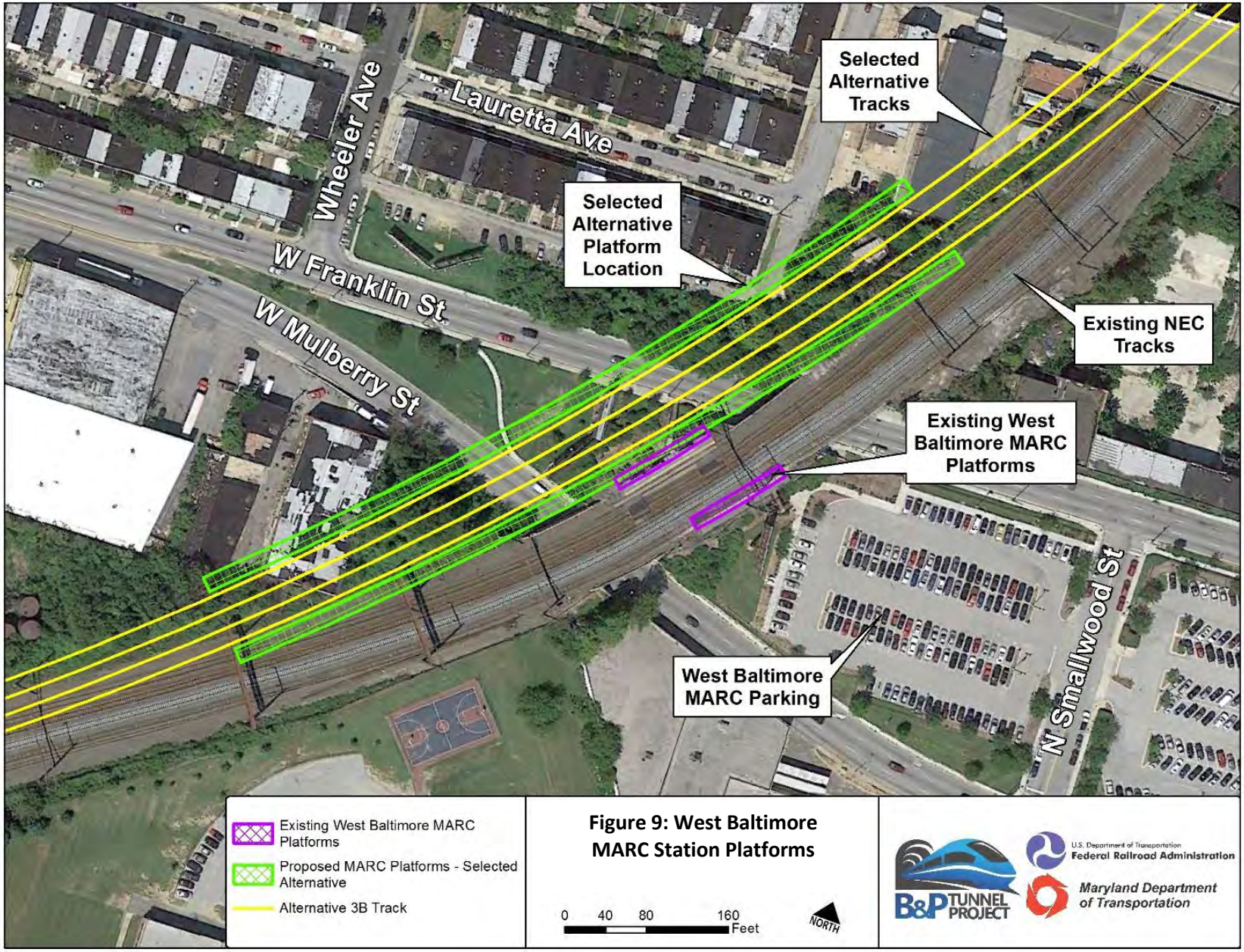


Figure 9: West Baltimore MARC Station Platforms

8. Construction

This section describes major construction elements for the Selected Alternative which were assumed for purposes of environmental impact assessment in the FEIS. The construction techniques described here are not prescriptive for detailed construction methodology, but are rather intended to provide a general overview of anticipated techniques. Descriptions of tunnel construction, ancillary structure construction, and open cut and cut-and-cover construction are provided. In addition, major construction staging areas are described along with associated truck routes. It is anticipated that construction techniques will be further refined during final design and construction phases, and will be implemented in a manner most suitable to the final design. Any modifications to construction techniques will also be evaluated during final design in consideration of the environmental analysis in the FEIS and commitments in this ROD.

The following construction methods will be employed:

- Construction by Tunnel Boring Machine (TBM);
- Construction by Mined Excavation Methods; and
- Construction by Open Cut and Cut-and-Cover Excavation Methods.

The Project will be constructed in variable ground conditions, including:

- Soft ground (soil);
- Mixed Face (concurrent exposure of soil and rock in the tunnel face); and
- Rock.

a. Construction by Tunnel Boring Machine (TBM)

The rail or running tunnels will be constructed by TBM and lined with a precast concrete segmental lining installed at the rear of the TBM, concurrent with excavation. The TBM excavates a full-circle cross-section using excavation tools contained in the TBM cutter head. The precast concrete segmental linings will be installed within the TBM tailskin concurrent with excavation.

b. Construction by Mined Excavation Methods

Underground ancillary structures required for tunnel operation will be constructed by mined excavation methods, generally using the Sequential Excavation Method (SEM).

SEM involves dividing the tunnel face into a series of horizontal and vertical excavation segments. Rock excavations will use modern controlled blasting methods, which reduce noise and vibration. The excavation cycle for rock excavation will include the drilling of blast holes, loading and detonating explosives, ventilating, inspecting blast results, removing excavated rock, and installing initial ground support.

Ancillary structures to be constructed by mined excavation methods include:

- Cross passages necessary for conformance to NFPA 130 requirements for passenger evacuation in event of an emergency;
- Tunnel sump/pump stations;
- An underground ventilation plenum for the Intermediate Ventilation Facility; and
- Openings to vertical egress shafts necessary for conformance to NFPA requirements for passenger evacuation in event of an emergency.

c. Construction by Open Cut and Cut-and-Cover Methods

Excavation by open cut and cut-and–cover methods will be performed for the following types of Project structures: ventilation facilities, vertical egress shafts, and for trackwork near the tunnel portals. Open cut and

cut-and-cover construction means that earth will be excavated from the surface removed from the area, and the resulting excavated area will be structurally supported from adjacent soils and ground.

The excavation support systems typically used include: soldier pile and lagging walls, secant pile walls, and concrete slurry wall (diaphragm wall).

d. Construction Staging Areas

Four major construction staging areas are required to construct the Selected Alternative. The locations are at the south portal area, the Intermediate Ventilation Facility site, the north portal ventilation facility, and the north portal area. More detail is included in the FEIS, including site maps and truck haul routes utilizing major thoroughfares for the construction staging areas.

9. Capital Cost Summary

A capital cost estimate has been calculated for the Selected Alternative and is shown in **Table 5**. The total capital cost for the Project is estimated as $4.52 billion in escalated dollars, assuming Project completion in 2025. The capital cost estimate is comprised of all major Project components as shown in the table below, including: construction of four new tunnels, trackwork, new MARC station, support facilities, sitework, Amtrak force account and flagging, right-of-way, engineering design, program management, agency support, construction support and management, mitigation, and risk. All Project elements, including the ventilation facilities, are included in this estimate. The cost estimate also includes cost escalation, assuming a design and construction period leads to Project completion in 2025. Any lengthening of the Project schedule would increase costs over this estimate.

Table 5: Capital Cost Estimate for the Selected Alternative

Code	Description	Item Cost (Million)	Cost Summary (Million)
1	***Construction Cost - four new tunnels***		
10	GUIDEWAY AND TRACK ELEMENTS	$1,020	
20	STATIONS, STOPS, TERMINALS, INTERMODAL	$5	
30	SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	$310	
40	SITEWORK AND SUPPORT CONDITIONS	$270	
50	SYSTEMS	$305	
	Total Construction		$1,910
2	***Force account and flagging***		
2.1	Amtrak F/A	$20	
2.2	LRT F/A	$4	
	Total F/A		$24
3	***Right of Way***		
3.1	Real Estate	$76	
	Total ROW		$76
4	***Existing B&P - Repair Construction Cost***		
	Total Construction		*TBD*
5	***Engineering Cost***		
5.1	Program Management (including the PM of existing Tunnel)	$15	
5.2	MDOT/City of Baltimore Support	$20	
5.3	Amtrak Project Support Phase 1	$80	
5.4	Final Engineering	$115	
5.5	Mitigation Tracking & Document Revision FE	$1	

Code	Description	Item Cost (Million)	Cost Summary (Million)
5.6	Construction Support	$150	
5.7	Construction Management	$99	
	Total Engineering Cost		$480
6	***Design Development/Risk***		
6.1	New Tunnel Design Development	$573	
6.2	New Tunnel - Risk Cost	$191	
6.3	Engineering/Management Change Process	$45	
6.4	ROW	$11	
	Total Design Development/Risk		$820
7	***Total Project Cost (2015 $$$)***		
7.1	Sum of Categories 1 through 6	$3,310	
7.2	Mitigation Cost	$50	
	Total Project Cost (2015 $$$)		$3,360
8	***Escalation and Risk***		
8.1	Const. & F/A:	580	
8.2	ROW	15	
8.3	Design Development & Risk Costs	385	
8.4	Engineering Cost	180	
	Total Escalation and Risk		1,160
	Total Project Budget for Completion in 2025		**$4,520**

IV. SUMMARY OF ENVIRONMENTAL CONSEQUENCES

This section summarizes the potential environmental impacts of the Selected Alternative. The FEIS includes a detailed environmental impact analysis of the Preferred Alternative, including analysis of the following resources: socioeconomics, cultural resources, Section 4(f) resources, natural resources, hazardous materials (HM), air quality, noise, vibration, and indirect and cumulative impacts. Direct, indirect, long-term and short-term impacts have been evaluated for each resource. Maps of the environmental impacts from the Selected Alternative are included in **Appendix A**.

Because the majority of the Selected Alternative is below ground, impacts primarily occur where the alignment intersects with the ground surface, including at the portals and proposed ventilation facility locations in the east Jones Falls area, Reservoir Hill community along North Avenue, and Midtown-Edmondson neighborhoods.

A. Socioeconomics

This summary of socioeconomic impacts includes the categories of Population and Housing, Land Use, Transportation, Businesses, Economy, Neighborhoods and Community Facilities, Visual and Aesthetic Resources, and Minority Race and Ethnicity and Low Income Populations. FRA defined the Study Area boundary for socioeconomic evaluation using a combination of Census Block Group and Census Tract boundaries. The Study Area was developed to include block groups and tracts within approximately 500 feet of the build alternative centerlines. It extends roughly from Druid Hill Park in the north to U.S. 40 in the south, the Gwynns Falls Bridge in the west, and east to I-83. A map of the socioeconomic Study Area boundary can be found in Chapter V of the FEIS.

1. Population and Housing

The Selected Alternative will demolish an estimated 22 residential buildings. Based on data from Baltimore City, as well as field reconnaissance in May, 2016, it is estimated that 15 out of the 22 potentially impacted residential buildings are currently occupied (Baltimore City, 2016). Because relocation opportunities are available and could occur within or proximal to the impacted neighborhoods, minimal impact to the Study Area population is anticipated under the Selected Alternative. Individuals relocated will experience temporary adverse effects from relocation.

2. Land Use

The Selected Alternative will be bored to an average depth of 115 feet below the existing surface. As a result, surface land use impacts and zoning changes will be minimized and restricted to portal and ventilation facility locations. The Selected Alternative will impact 0.5 acres of residential land use, 2.6 acres of industrial land use, 3.4 acres of commercial land use, and 6.7 acres of other land uses. For more detailed description of land use impacts, refer to the FEIS.

Because of ongoing redevelopment efforts in the immediate vicinity of the 900-940 West North Avenue Intermediate Ventilation Facility site, such as the Baltimore Innovation Village project, it should be noted that the Project plans for the site are still preliminary and subject to change. Additionally, improved transit service and accessibility at the West Baltimore MARC Station could help to support Transit-Oriented Development (TOD) near the station.

3. Transportation

The Selected Alternative will cause long-term impacts to the roadway network in the Bridgeview/Greenlawn and Midtown-Edmondson neighborhoods as a result of south portal construction. These impacts include the realignment of North Pulaski Street to connect to West Lanvale Street and the closure of West Mosher Street at North Payson Street. The closure of West Mosher Street will not substantially disrupt traffic flows or connectivity because Mosher Street currently dead-ends at the NEC west of Payson Street. Additionally, the Selected Alternative is anticipated to eliminate an estimated 85 on-street parking spaces.

The Selected Alternative maintains the existing northbound I-83 off-ramp to North Avenue. Construction of the Selected Alternative may include temporary closures of the ramp. Any short-term closures will be coordinated with Baltimore City and the Federal Highway Administration (FHWA).

The Selected Alternative will require reconstruction of the West Baltimore MARC Station in order to align with the new trackway. The MARC Station will shift, but will remain in the same general location between Franklin and Mulberry Streets and adjacent to the existing West Baltimore MARC parking facilities. The Selected Alternative will orient the reconstructed MARC station along a flatter curve, thus allowing the proposed station to be constructed with ADA-compliant, high-level platforms. A rebuilt station with high-level platforms will improve accessibility at the station relative to existing conditions and be consistent with FTA and MTA goals of bringing the station into compliance with ADA requirements. Furthermore, the mitigation for the Project will include modern station amenities such as lighting and benches, as described in **Section V**.

The Selected Alternative will benefit passenger rail through Baltimore City by providing more efficient travel and reduction of delays for users of Baltimore Penn Station and the West Baltimore MARC Station. The Selected Alternative will also improve accessibility at the West Baltimore MARC Station as described above. Relative to the No-Build, travel times (in minutes:seconds) between the Gwynns Falls Bridge and Baltimore Penn Station under the Selected Alternative will improve by an estimated 2:31 (for Amtrak Acela), 2:32 (Amtrak Regional), and 1:42 (MARC) relative to existing conditions (average of northbound and southbound). The combined effects of better operational reliability with fewer delays, reduced NEC travel times, and increased accessibility at the

West Baltimore MARC Station could encourage automobile users to use transit for commuter and intercity travel, ultimately reducing vehicle miles traveled.

Short-term impacts to bus, automobile, pedestrian, and bicycle travel routes, including temporary street closures and detours, may occur during construction. Other short-term impacts may include temporary disruption to the operation of the North Avenue Light Rail Station, and minor disruptions to Amtrak, MARC, and NS freight operations.

The Selected Alternative will be constructed below the existing MTA Light Rail line in the vicinity of the North Avenue Light Rail Station. Construction of the Project will be coordinated with MTA to ensure minimal disruption to light rail service during construction of the Project. It is possible that disruptions to light rail service may occur for a limited time frame, such as overnight when light rail revenue operations are not occurring or potentially over a weekend.

The alignment of the tunnels will be constructed at an adequate depth below the Baltimore Metro tunnels to ensure there is no disruption to MTA Metro service or damage to the MTA Metro tunnels.

4. Businesses

The Selected Alternative will result in a total of approximately 13 business displacements, including six at the south portal and seven at the Intermediate Ventilation Facility. These displacements will occur in the Bridgeview/Greenlawn, Midtown-Edmondson, and Reservoir Hill neighborhoods. Impacts may also include loss of employment and loss of income to people working at these businesses. Impacts to neighborhood cohesion and character could result from the displacement of businesses including healthcare, professional services and daycare services. FRA is committed to working with community stakeholders to ensure compatibility of new Project structures with surrounding land uses to the extent practicable, including planned developments that may occur prior to or concurrent with final design such as the Baltimore Innovation Village initiatives and redevelopment of the Madison Park North property.

The Selected Alternative could cause temporary construction impacts to businesses, such as temporary disruptions or modifications to trucking routes, loss of parking, and difficulty accessing businesses caused by roadway and sidewalk closures, as well as disruptions in regular traffic circulation due to implementation of truck haul routes.

5. Economy

The most immediate economic effect of the Selected Alternative will be the benefit from construction activity in the region associated with new employment opportunities. Additional economic benefits from the Selected Alternative will be generated through the use of the rail service and market response to the additional rail activity accommodated by the new tunnel's greater capacity.

6. Neighborhoods and Community Facilities

Four places of worship, all located in the Midtown-Edmondson neighborhood, will be displaced as a result of south portal construction. The places of worship are located at the edges of residential blocks that are adjacent to industrial land use in the Midtown-Edmonson neighborhood. The displacement of these places of worship will disrupt their respective operations, resulting in potential impacts to community services and networks.

7. Visual and Aesthetic Resources

The Project will result in visual and aesthetic quality changes to the surrounding environment, during and after construction. A majority of the Selected Alternative will be an underground tunnel and will not be visible. Changes to visual and aesthetic resources will result from three Project components: tunnel portals, ventilation facilities, and the new tracks and railroad bed at each end of the portals (trackway).

8. Minority Race and Ethnicity and Low Income Populations

The Selected Alternative will have disproportionately high and adverse effects to Environmental Justice (EJ) populations as a result of property acquisition and impacts to housing, land use/zoning, community facilities, visual quality, and noise. All of the Census Block Groups proximal to the Selected Alternative are primarily occupied by minority and/or low-income populations and are therefore considered EJ populations. As a result of south portal construction and the South Ventilation Facility, impacts to property acquisition, housing, land use/zoning, community facilities, and visual quality will be more adverse within the Midtown-Edmondson neighborhood compared to other identified EJ populations. The Selected Alternative will require 22 residential building demolitions, 13 business displacements and four community facilities (churches) displaced, all of which are in minority and low-income communities. **Section V** outlines mitigation measures to address these impacts. **Section VII.C** contains an additional discussion of EJ considerations. FRA is committed to working with community stakeholders to ensure Project structures are compatible with surrounding land uses to the extent practicable. The continuing improvement of rail service to Baltimore will help to efficiently deliver passengers to Baltimore and support the future economic vitality of the City.

B. Public Health and Safety

1. Public Health

No impacts to public health from the Selected Alternative are anticipated. The Selected Alternative will conform to federal and state air quality standards. The Selected Alternative will have no significant effects to air quality in the Study Area and the net change in emissions of nitrogen oxides (NO_x), volatile organic compound (VOC), and particulate matter ($PM_{2.5}$) between 2040 No-Build (Alternative 1) and the 2040 Build scenario (Selected Alternative) will be below *de minimis* levels, established by the U.S. Environmental Protection Agency (EPA).

Noise impacts were assessed using FTA guidelines, detailed in **Section IV.I.** Prior to mitigation, the Selected Alternative would have permanent operational impacts to 437 persons, of which 141 would be severely impacted. Severe impacts are estimated at approximately 66 to 72 A-weighted decibels (dBA), prior to mitigation, compared to the existing background noise level of approximately 63 dBA. For comparison, 72 dBA would be somewhat less than the sound of a city bus idling from a distance of 50 feet (approximately 75 dBA). The Selected Alternative includes multiple measures to mitigate anticipated operational noise impacts, including noise barriers. Noise barriers will be designed to reduce the severe noise impacts to levels below the FTA severe impact criteria (66 dBA for residential land uses, or 71 dBA for institutional). The Selected Alternative may also have temporary noise impacts during construction at residences and other sensitive receptors along the Project alignment.

Additional detail is needed regarding the potential for the Selected Alternative to encounter contaminated soil and groundwater during construction near sites contaminated with HM. If a public health and safety concern is identified during future HM investigations, provisions within the investigation Health and Safety Plan (HASP) will be implemented and regulatory authorities will be notified to appropriately mitigate the hazardous material concerns. Detailed discussion of HM is included in **Section IV.F.**

2. Safety

The Selected Alternative will conform to the comprehensive life safety approach included in the NFPA 130 *Standard for Fixed Guideway Transit and Passenger Rail Systems*. These standards provide regulations for fire safety requirements in underground, surface, and elevated fixed guideway transit and passenger rail systems, including stations and tunnels. The Selected Alternative will also conform to FRA's comprehensive set of railroad safety regulations found at 49 C.F.R. Part 209 *et seq*.

3. Children's Health and Safety

The Selected Alternative will pose no health or safety risks that would disproportionately affect children. The proposed location for the Intermediate Ventilation Facility at 900-940 North Avenue is located adjacent to John Eager Howard Elementary School. Emissions associated with the ventilation facility will not cause, or substantially contribute to a violation of National Ambient Air Quality Standards (NAAQS), standards established by the U.S. EPA, to protect human health and welfare, including children. Air quality modeling presented in **Section IV.H** shows emissions for the Selected Alternative well below applicable *de minimis* thresholds. Furthermore, ventilation facilities will include vertically-oriented fans to ensure adequate dispersion of emissions.

Contaminated soil and/or groundwater encountered during construction will be treated in accordance with federal, state, and local regulations and disposed of at a Maryland Department of the Environment (MDE)-approved treatment and/or disposal facility. More information on Children's Health and Safety concerns is included in Section VI.B.3 of the FEIS.

C. Cultural Resources

Effects to cultural resources have been evaluated pursuant to Section 106 of the National Historic Preservation Act of 1966 (NHPA) (54 U.S.C. § 306108), as amended, (Section 106). Section 106 , requires federal agencies with jurisdiction over a proposed federal or federally-assisted undertaking to take into account the effects of the undertaking on historic properties and afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment. The historic preservation review process mandated by Section 106 is outlined in regulations issued by the ACHP that are available at 36 C.F.R. Part 800. Under Section 106, historic properties include any prehistoric or historic district, site, building, structure, object, or landscape included in, or eligible for inclusion in, the National Register of Historic Places (NRHP).

Through Section 106 consultation, FRA engaged in a robust evaluation of historic properties within the Area of Potential Effects (APE) for the Project, including technical studies for both historic architecture and archeology. FRA's continued consultation with the Maryland Historical Trust (MHT), Maryland's State Historic Preservation Office (MD SHPO), and other consulting parties, including consideration of consulting parties' comments into the process of refining and identifying the Preferred Alternative, has aided in avoiding and minimizing adverse effects to cultural resources to the extent practicable.

Through consultation, FRA determined that the Selected Alternative will have an adverse effect to nine historic properties, including the Baltimore and Ohio Belt Line Railroad, the Baltimore and Ohio Belt Line Bridge over Jones Falls Valley, the Baltimore and Potomac Railroad, the Reservoir Hill Historic District, the Midtown Edmondson Historic District, Bridge BC 2410 Lafayette Avenue over Amtrak, the Atlas Safe Deposit and Storage Company Warehouse Complex, the Greater Rosemont Historic District, and the Edmondson Avenue Historic District. More details of individual architectural historic property effects are provided in the *Architectural Historic Properties Effects Assessment Report* and the FEIS.

On November 20, 2015, the MD SHPO concurred with FRA's adverse effect determination. The MD SHPO also concurred on FRA's supplementary historic property identification on October 11, 2016.

The results of the *Phase IA Archaeological Study* show that although large portions of the Study Area have been disturbed, the potential for both pre- and post-contact archaeological sites still exists. While the subsurface integrity is probably poor for most areas within the Project APE, an occasional intact archaeological site could be encountered. Accordingly, FRA has elected to complete final identification, evaluation, and effects assessment on archeological resources in phases, pursuant to 36 C.F.R. § 800.4(b)(2) and 36 C.F.R. § 800.5(a)(3).

FRA, the MD SHPO, Amtrak, and Preservation Maryland executed a Project Programmatic Agreement (PA) on March 2, 2017 (**Appendix B**). The Baltimore City Commission for Historical and Architectural Preservation

(CHAP), BCDOT, Baltimore City Planning Department, Baltimore Heritage, Baltimore Heritage Area Association, MDOT, MTA, and Mount Royal Improvement Association have accepted the FRA's invitations to be concurring parties to the PA.

The PA summarizes the results of the Section 106 process and the treatment measures agreed to among the PA signatories and concurring and consulting parties, including treatment measures for architectural resources and archeological resources. As described in the PA, detailed archaeological identification and effects studies will be undertaken at a later date. In addition to the stipulations for archaeological identification and effects studies, some of the other major PA stipulations include the establishment of a preservation fund, subject to certain conditions; design reviews; cultural resources construction protection plans; documentation; interpretive material; and electronic informational sites.

D. Section 4(f) Properties

Section 4(f) of the U.S. Department of Transportation (USDOT) Act of 1966 (49 U.S.C. § 303(c)) is a federal law that protects publicly-owned parks, recreation areas, wildlife and/or waterfowl refuges, or any significant historic sites, whether privately or publicly owned. Section 4(f) requirements apply to all transportation projects that require funding or other approvals by the USDOT. As a USDOT agency, FRA must comply with Section 4(f).

The FEIS included a Final Section 4(f) Evaluation (Evaluation) that assessed the use of Section 4(f) properties by the B&P Tunnel Project alternatives and evaluated feasible and prudent alternatives that avoid the use of Section 4(f) properties. Based on this Evaluation, there are no feasible and prudent alternatives that will avoid use of all Section 4(f) properties. The Evaluation concluded that the Selected Alternative will result in the least overall harm in light of the statute's preservation purposes, and identified appropriate measures to minimize harm. The Selected Alternative incorporates all possible planning to minimize harm to Section 4(f) properties, as documented in the Evaluation and FEIS.

The Final Section 4(f) Evaluation also provides FRA's *de minimis* impact findings for some Section 4(f) properties. Potential *de minimis* impacts were presented for public review and comment with the DEIS, in conjunction with the requirements of NEPA. FRA has based the final *de minimis* impact determinations on impacts associated with the Selected Alternative (Alternative 3B) and continued coordination with the officials with jurisdiction over the resources.

The Selected Alternative will result in use of nine Section 4(f) properties, including the Baltimore and Ohio Belt Line Railroad, Baltimore and Ohio Belt Line Bridge over Jones Falls Valley, Baltimore and Potomac Railroad, Midtown Edmondson Historic District, Bridge 2410 / Lafayette Avenue over Amtrak, Greater Rosemont Historic District, Atlas Safe Deposit and Storage Company Warehouse, the Edmonson Avenue Historic District, and the Reservoir Hill Historic District. The Selected Alternative will have *de minimis* impacts on an additional three Section 4(f) properties including Fire Department Engine Company No. 36, the Ward Baking Company, and the Union Railroad. **Table 6** provides an overview of the Section 4(f) properties requiring use.

Table 6: Use of Section 4(f) Properties

Alternative	Selected Alternative
Section 4(f) Properties	9 use 3 *de minimis*
Use	• B&O Belt Line Railroad • B&O Belt Line Bridge • B&P Railroad • Bridge 2410 / Lafayette Avenue • Midtown Edmonson Historic District (27 demolitions, 8 other) • Greater Rosemont Historic District (5 demolitions, 15 other) • Edmonson Avenue Historic District (2 demolitions, 13 other)

Alternative	Selected Alternative
	• Atlas Storage Co • Reservoir Hill Historic District (1 demolition)
De Minimis	• Fire Company 36 • Ward Baking Co • Union Railroad
Total Contributing*	54 Total 31 Demolitions

**Number of historic resources contributing to historic districts. Note that some buildings contribute to multiple historic districts. Does not include B&P Railroad contributing elements.*

1. Section 4(f) Properties Requiring Use

Removal of major substructural pier elements of the B&O Belt Line Bridge over Jones Falls Valley will be required to construct the Selected Alternative. This will alter historic characteristics in a manner that will diminish historic integrity, resulting in an adverse effect under 36 C.F.R. § 800.5 to the individually eligible Belt Line Bridge and to the B&O Belt Line Railroad district, and result in a Section 4(f) use.

The Selected Alternative will result in modifications to elements of the historic Baltimore and Potomac Railroad alignment, such as trackwork and catenary. The existing B&P Tunnel, a contributing element of the Baltimore and Potomac Railroad historic district, will be abandoned in a manner that will allow for future transportation use. The modifications to the historic site will alter historic characteristics of the rail line in a manner that will diminish the site's historic integrity and will result in an adverse effect per 36 C.F.R. § 800.5 and a Section 4(f) use.

Construction of the Selected Alternative will require permanent incorporation of modifications to elements of the Baltimore and Potomac Railroad historic district such as the trackwork, bridges, catenary, and right-of-way that will constitute a Section 4(f) use. These modifications will result in the permanent incorporation of land and will bisect the existing alignment and shift the alignment east. The harm to the historic site will alter historic characteristics of the rail line in a manner that diminishes historic integrity and results in an adverse effect per 36 C.F.R. § 800.5.

Construction of the south portal approach for the Selected Alternative will require demolition of 27 historic buildings or other contributing elements to the Midtown Edmondson Historic District and modification of two contributing bridge structures. The Selected Alternative will result in permanent incorporation of portions of an additional six contributing properties that will not require demolition under the Selected Alternative. The demolition of historic buildings and other contributing elements and the permanent incorporation of land will constitute a Section 4(f) use. The demolitions and modifications will alter historic characteristics of the historic buildings and contributing properties in a manner that will diminish their historic integrity, resulting in adverse effect per 36 C.F.R. § 800.5.

Construction of the south portal approach for the Selected Alternative will require demolition of five historic buildings contributing to the Greater Rosemont Historic District. Portions of an additional 15 properties contributing to the Greater Rosemont Historic District will be permanently incorporated without building demolition. The demolition and permanent incorporation of historic resources will constitute a Section 4(f) use, and will alter historic characteristics in a manner that will diminish historic integrity resulting in adverse effect per 36 C.F.R. § 800.5.

The Selected Alternative will require demolition of one of the three existing buildings in the Atlas Safe Deposit and Storage Company Warehouse complex in order to construct the south portal approach. Neither the building facing Lafayette Avenue nor the ancillary garage will be directly impacted by the Selected Alternative, and the rear building will be demolished. This permanent incorporation of the historic resource will result in a Section

4(f) use. Harm to the historic site will alter historic characteristics in a manner that will diminish historic integrity resulting in an adverse effect per 36 C.F.R. § 800.5.

The Selected Alternative will require demolition and permanent incorporation of two buildings contributing to the Edmonson Avenue Historic District in order to construct the south portal approaches and maintain connectivity along existing streets. An additional 13 contributing elements in the Edmonson Avenue Historic District will be partially incorporated but will not be demolished. The demolition and permanent incorporation of historic properties will result in a Section 4(f) use. The harm to the historic site will alter historic characteristics in a manner that will diminish historic integrity, and thus will result in adverse effect per 36 C.F.R. § 800.5.

The Intermediate Ventilation Facility is proposed for a site at 900-940 West North Avenue. The site will require demolition and permanent incorporation of one contributing historic element, a historic commercial building. Use of the contributing historic element at the 900-940 West North Avenue site will alter historic characteristics in a manner that will diminish historic integrity, and thus will result in an adverse effect per 36 C.F.R. § 800.5. The Project Consulting Parties noted the low level of importance of the commercial building at 900-940 West North Avenue in relation to the Reservoir Hill Historic District.

2. De Minimis Impacts

The Selected Alternative will require the incorporation of a portion of the parking lot at the Fire Department Engine Company No. 36 property which is located at the rear of the building. However, this will not diminish historic integrity of the historic site and FRA has determined and the SHPO has concurred that this will not result in an adverse effect per 36 C.F.R. § 800.5. Therefore, FRA has determined that the impact is *de minimis* pursuant to Section 4(f).

The Selected Alternative will require the incorporation of a small portion of the Ward Baking Company property; however, the Ward Baking Company building will remain intact. This will not diminish historic integrity of the historic site and FRA has determined and the SHPO has concurred that this will not result in an adverse effect per 36 C.F.R. § 800.5. Therefore, FRA has determined that the impact is *de minimis* pursuant to Section 4(f).

The Selected Alternative will result in modifications to elements of the historic Union Railroad alignment, such as trackwork and catenary. The modifications to the historic site will not diminish historic integrity, and FRA has determined and the SHPO has concurred that this result in no adverse effect per 36 C.F.R. § 800.5. Thus, FRA has determined the impacts from the Selected Alternative to the Union Railroad are *de minimis*. More information is included in **Section VII.B**.

E. Natural Resources

Natural resource impacts are summarized in the categories of soils, water resources, and wildlife and habitat.

Mitigation commitments related to natural resource impacts are included in **Section V** of this ROD. Mitigation plans will be developed during final design, including a Stormwater Management Plan, Erosion and Sediment Control Plan, Rodent Abatement Plan, Street Tree Protection and Forest Conservation Plans, a plan for floodplain mitigation, Tunnel Sump Water Treatment, and Disposal Plan. Additionally, the Selected Alternative will include implementation of vegetative buffers to screen right-of-way along the NEC in the Study Area.

1. Soils

The Selected Alternative will remove large quantities of soil through either tunnel boring or cut-and-cover construction. For information on the disposal of soil see **Section IV.G.** Construction areas will also expose the soil surface in portal and vent shaft locations, requiring stabilization to limit surface runoff and sediment pollution to surface waters. Construction mitigation measures are addressed in **Section V.** Soil types within the

Study Area will not likely be significantly impacted by the Selected Alternative, as the soil is already highly urbanized.

2. Water Resources

The Jones Falls, the Gwynns Falls, and a tributary of the Gwynns Falls are located within the Study Area. The Selected Alternative will remain on existing structures over these waterbodies, and therefore will not directly impact them. Minor impacts to water quality are possible from sediment and other construction-related runoff, but will be limited by required erosion and sediment control measures. The Selected Alternative includes measures to ensure compliance with all applicable stormwater management regulations.

Collected groundwater will likely be discharged into public sewers near Project areas at each particular discharge site in accordance with the applicable regulations. Before discharge, some forms of treatment are expected to be necessary. As a minimum, the removal of suspended solid and removal of oils/greases will be addressed.

The Selected Alternative will impact approximately 3.4 acres of the Jones Falls' 100-year and 500-year floodplains, including a permanent impact from new track construction and a temporary impact from construction staging areas. These impacts are not anticipated to involve a significant encroachment of the floodplains, and the combined effects will not raise the flood level one foot. A plan for floodplain mitigation will be developed during final design of the Selected Alternative. A MDE Non-Tidal Wetlands and Waterways Permit will be required for work within the 100-year floodplain. Because the north portal will be within the Jones Falls floodplain, final design of the Selected Alternative will be designed to minimize flood hazard risk for the new infrastructure.

DOT Order 5650.2 implements Executive Order 11988, Floodplain Management. These orders state that FRA may not approve an alternative involving a significant encroachment unless FRA can make a finding that the proposed encroachment is the only practicable alternative. The Selected Alternative, which includes the development of a floodplains mitigation plan and final design that will minimize flood hazard risk, will not result in any substantial adverse impact on natural and beneficial values of the floodplains or substantial change in flood risks or damage. Based upon these findings, FRA determines that the Project is consistent with the requirements of Executive Order 11988 and DOT Order 5650.2.

The Selected Alternative would not directly or indirectly impact any wetlands.

3. Wildlife and Habitat

The B&P Tunnel will have minor impacts on wildlife and their habitat, since most of the Project will take place underground. Above-ground trackwork, portals, and ventilation facilities will primarily impact urban areas with little habitat value.

Bat populations will be evaluated and considered in the disposition of the existing B&P Tunnel. This mitigation commitment was added based on public comment received at the December 2016 FEIS Community Information Meetings.

The U.S. Fish and Wildlife Service (USFWS) has concurred that no Maryland or federally-listed threatened or endangered species are known to exist within the Study Area.

The Selected Alternative will impact four forest stands totaling approximately 109,750 square feet (SF). Impacts to four hedgerows within the south portal area will total 40,200 SF. An estimated 101 street trees and landscaped trees will be affected due to construction impacts near the tunnel portals and ventilation facilities. Affected street trees, forest stands, and hedgerows will be replaced in accordance with Baltimore City and Maryland Department of Natural Resources (DNR) requirements. Mitigation within the right-of-way will be on a 1:1 basis, and on private land, landscaping and tree replacement will be considered within the immediate vicinity of the resource effects.

F. Hazardous Materials

Construction of the Selected Alternative near contaminated sites is expected to involve encounters with contaminated soil and groundwater. A total of 112 sites of concern were identified within one mile of the Selected Alternative alignment, including 67 low-priority sites, 38 moderate priority locations and 7 high-priority sites. These existing hazardous material sites include residences, dry cleaners/laundromats, schools, automotive maintenance facilities, gas stations, fire stations, community resource centers, industrial properties, and railway yards within the Study Area. Eight low-priority sites of concern were identified within 500 feet of the Intermediate Ventilation Facility. Refer to the FEIS for a list and description of the HM sites of concern.

Although the HM assessment focused on historical environmental releases in the vicinity of the Selected Alternative, other sources of contamination or HM mobilized during construction of the Project have the potential to impact the surrounding community or local environment. Remediated sites may also contain residual subsurface contamination that could be impacted by construction. Local communities and the surrounding environment could be exposed to existing HM mobilized as waste material if present within the tunnel limits of disturbance. Mobilization could include vapors in the soil pore space due to tunnel pressurization, dust and solids mobilized during tunneling, excavation, transport and disposal, or groundwater impacted by the movement of HM or contaminants into the dissolved phase.

Mitigation measures will be needed where construction encounters contaminated soil and/or groundwater. Excavated soil will be sampled, treated, and/or disposed of in accordance with federal, state, and local regulations. If other contaminants, such as metals, are detected above MDE non-residential screening levels, soil and/or groundwater will be handled in accordance with applicable laws and regulations and disposed of at an MDE-approved treatment and/or disposal facility. Project-specific material handling and plans for health and safety and emergency response will minimize risks. Specific mitigation commitments documented in this ROD include development and implementation of a Hazardous Spill Prevention Plan, Emergency Management Plan, Hazardous Materials Remediation Plan, groundwater Screening and Materials Handling plan, and a program for identification and segregation of impacted soils for testing and disposal.

For information on potential transportation of HM through the Selected Alternative, see **Section IV.P**.

G. Solid Waste

Because the Selected Alternative involves boring a new underground tunnel, it will generate solid waste. The primary source of solid waste during the construction phase will be excavated earthen material. The greatest amount of total solid waste generated will result from shaft and tunnel boring activities, while the site preparation phases may also involve the removal of additional amounts of excavated material. The total amount of soil and rock to be excavated for the Project is approximately 47 million cubic feet (1.8 million cubic yards) of material. Once excavated from its natural state, the volume increases. Approximately 70 million cubic feet (2.7 million cubic yards) of material will require disposal throughout the course of the Project. Building material resulting from demolition will also be generated. Any solid waste generated, including during construction, demolition, and land clearing, must be and will be properly disposed of at a permitted solid waste acceptance facility. A program for identification, segregation, treatment, and disposal of potential HM will be implemented during construction.

H. Air Quality

Pursuant to the requirements of the Clean Air Act (CAA) (42 U.S.C. § 7401 *et seq*.), the EPA establishes, enforces, and periodically reviews the NAAQS for six common air pollutants, referred to as criteria pollutants—carbon monoxide (CO), lead, NO_2, ozone, sulfur dioxide (SO_2), and PM. The EPA designates areas as either meeting

(attainment) or not meeting (nonattainment) the NAAQS. An area with measured pollutant concentrations lower than the NAAQS is designated as an attainment area and an area with pollutant concentrations that exceed the NAAQS is designated as a nonattainment area. Once a nonattainment area meets the NAAQS and the additional redesignation requirements in the CAA, the EPA will designate the area as a maintenance area.

The General Conformity Rule of the CAA prohibits federal agencies (such as FRA) from permitting or funding projects that do not conform to an applicable State Implementation plan (SIP). The General Conformity Rule applies only to areas that are in nonattainment or within a maintenance status. Under the Rule, project-related emissions of the applicable nonattainment/maintenance pollutants are compared to *de minimis* level thresholds. If the emissions exceed the thresholds, a formal Conformity Determination is required to demonstrate that the action conforms to the applicable SIP. Conversely, if project-related emissions are below the *de minimis* levels, the project is assumed to conform to the SIP. The proposed Project will require input and/or approval by the FRA; therefore, the General Conformity requirements of the CAA are applicable.

The B&P Tunnel Project is located in Baltimore City, Maryland, which is presently designated by the EPA as a moderate nonattainment area for the eight-hour ozone, and a maintenance area for $PM_{2.5}$. Although a portion of Baltimore City is designated as a maintenance area for CO, the B&P Tunnel Project is located outside of the maintenance area.

The Selected Alternative will result in emissions from rail operations, ventilation facilities operations, and construction activities. The analysis of potential operational air quality effects from the Selected Alternative, documented in the FEIS, determined that no adverse impacts to air quality will result from the Selected Alternative. The modeled net increase in emissions will not exceed the applicable *de minimis* thresholds, as shown in **Table 7**.

The tunnel operations data for the No-Build Alternative in 2040 and the Selected Alternative in 2040 were used to determine if any air quality impacts in exceedance of applicable *de minimis* thresholds would result from rail operations through the existing and new tunnels. Increased diesel emissions are anticipated to come only from MARC trains. Amtrak's trains are electric, and freight rail operations are not expected to increase as a result of the Selected Alternative. Diesel emissions under the No-Build Alternative and Selected Alternative were estimated based upon the length of the tunnels and emissions factors provided by U.S. EPA for CO, VOC, NO_x, and PM. Emissions of SO_2 are dependent on fuel properties, and therefore the U.S. EPA does not provide any locomotive-specific emission factors. As shown in **Table 7**, the MARC equipment and operational changes will not have any significant effects on air quality because the net changes in emissions of VOC, NO_x, and $PM_{2.5}$ will be below the *de-minimis* levels.

Table 7: Diesel Locomotive Emissions (2040)

Scenario	CO	VOC	NO_x	PM_{10}	$PM_{2.5}$
2040 No-Build Alternative	8.6	0.3	6.7	0.1	0.1
2040 Selected Alternative	19.4	0.6	15.2	0.2	0.2
Net Increase	**10.9**	**0.3**	**8.5**	**0.1**	**0.1**
De Minimis Threshold	--	50	100	--	100
Below *De Minimis*?	**--**	**Yes**	**Yes**	**--**	**Yes**

Notes: De Minimis thresholds do not apply within an area in attainment for that specific pollutant. The Project is in an attainment area for CO and PM_{10}.
Values of "Net Increase" subject to rounding. All values in table rounded to the nearest 0.1 tons.
U.S. EPA does not provide any SO_2 or SO_x emissions factors (see Emission Factors for Locomotives, EPA-420-F-09-025, April 2009); furthermore, the project is in an attainment area for SO_x.

As shown in **Table 7**, the Selected Alternative will have no net increase in operational emissions exceeding applicable *de minimis* thresholds. The Selected Alternative will result in no projected increase in diesel freight train operations, and no significant air emissions are generated by electric locomotive trains (e.g., Amtrak). Net

increases in emissions will be due to diesel MARC trains[4]. The No-Build and Selected Alternative diesel emissions were estimated based upon emissions factors provided by the EPA (EPA, 2009). As shown in **Table 7**, the MARC equipment and operational changes will have no significant effects on air quality, as the net change in emissions of NO_x, VOC, and $PM_{2.5}$ between the 2040 No-Build Alternative and the 2040 Selected Alternative scenarios will be below the *de minimis* levels.

As noted above, the net emissions increases will be due to diesel MARC trains. These diesel engines could also produce higher operational costs for the ventilation facilities. The increase in cost could come from a need to operate more ventilation fans at a higher normal frequency to evacuate heat and emissions from the tunnel system.

Construction-related emissions attributed to the exhaust of heavy equipment and trucks were estimated in the FEIS. Emissions also result from construction crew worker vehicles traveling to and from the construction site; and fugitive dust from site preparation, land clearing, material handling, and equipment movement. Notably, these emissions are temporary in nature and generally confined to the construction site and access/egress roadways. The total emissions associated with construction activities are below the *de minimis* threshold of 100 tons per year for NO_x and $PM_{2.5}$, and 50 tons per year for VOC. Therefore, a Conformity Determination is not required and the B&P Tunnel Project is presumed to comply with the SIP.

The American Meteorological Society/U.S. EPA Regulatory Model (AERMOD) was used to evaluate the potential 1-hour NO_2 emissions from the proposed ventilation facilities. The maximum predicted 1-hour NO_2 concentration from all sources combined (the three ventilation facilities as well as the north and south portals) was 12.8 parts per billion (ppb). When added to the NO_2 background concentration of 51 ppb, the total predicted 1-hour concentration amounted to 63.8 ppb, which is below the NAAQS of 100 ppb. Emission studies have demonstrated that if concentrations of NO_2 are maintained within acceptable levels, all other criteria pollutant concentrations associated with diesel exhaust emissions will be within acceptable levels of the NAAQS (Parsons Brinkerhoff/Parsons, 2015). Prevailing winds in Baltimore City are generally from the northwest; prevailing wind patterns were taken into account in the analysis.

Improvements to passenger rail infrastructure associated with FRA's HSIPR program (particularly along the NEC), resulting in improved travel times, greater reliability, and increased accessibility have the potential to improve the competitiveness of Amtrak and MARC with other modes of transportation, such as automobiles. According to the U.S. Department of Energy (USDOE), rail travel also contributes less greenhouse gas (GHG) emissions per passenger mile than either automobiles or airplanes (USDOE, 2015). Support for the increased competitiveness of Amtrak and MARC passenger rail with other travel modes, particularly single-occupancy vehicles, will potentially result in increased energy efficiency per passenger mile and corresponding reductions in GHG emissions that would not otherwise occur under Alternative 1: No-Build.

I. Noise

Because FRA has not established noise and vibration guidelines, FRA defers to guidelines published by the FTA. The operational noise effects were evaluated using the guidelines set forth by the FTA *Transit Noise and Vibration Impact Assessment* (FTA, 2006). The temporary construction effects were also evaluated using both the FTA guidelines and COMAR 26.02.03—*Control of Noise Pollution*.

In accordance with the FTA *Transit Noise and Vibration Impact Assessment* guidelines, a screening assessment was conducted to identify locations where the Project may cause noise impact. Noise impact was assessed for the Selected Alternative using the FTA Detailed Assessment methodology. Based on the results of the DEIS analysis (i.e., FTA General Assessment), noise impacts were predicted to occur only in vicinity of the south portal. Therefore, a Detailed Noise Analysis was carried out for noise sensitive receptors in this area for the FEIS

[4] MTA announced plans in August 2015 to replace its electric MARC locomotives with an all-diesel fleet.

alternatives. The results of the FTA Detailed Assessment are presented in the FEIS and summarized in this section.

The FTA noise criteria are delineated into two categories: moderate and severe impact. Noise levels were calculated at discrete receptor locations along the railroad including any noise reduction from shielding due to building rows or where the alignment was in a cut (i.e., trench). The results were then compared to the FTA impact criteria to identify moderate and severe impacts. Based on current U.S. Census data, a total of 437 persons were predicted to be impacted, of which 141 were predicted to be severely impacted. A severe impact would occur at 66 dBA or higher for a residential context. For comparison, 66 dBA is approximately equivalent to normal speech at 3 feet (AASHTO, 1993). One school, the Mary Ann Winterling Elementary School, was predicted to be moderately impacted.

Noise levels in the immediate vicinity of the ventilation facilities will increase due to the continual operation of the ventilation fans within each facility. The ventilation facilities will be designed in order to meet the Baltimore Health Code noise regulations and will be designed to be below the L_{max} 50 dBA noise limit. A noise level of 50 dBA is roughly between that of a refrigerator and an air conditioner at a distance of three feet.

The Selected Alternative will include design and implementation of noise barriers to mitigate anticipated severe operational noise impacts in order to reduce impacts below severe levels. The FEIS includes more information on proposed sound barrier placement for noise mitigation.

Temporary noise impacts may occur during construction of the B&P Tunnel at residences and other sensitive receptors along the proposed Project. To reduce any construction noise impacts that may occur, the Project will develop and implement a Construction Noise Mitigation Plan.

FRA identified a typographical error in the FEIS Noise Impacts Section, noted here for correction. Table VI-35: Tunnel Operating Characteristics in the Build Year (2040) on page VI-120 erroneously listed the locomotive type of freight service as electric, and the Metropolitan Amtrak service as diesel. The Metropolitan Amtrak service is in fact powered by electric locomotives, whereas freight services are powered by diesel locomotives. This error was only in the table and did not affect the accuracy of the analysis results.

J. Vibration

This section summarizes the assessment of vibration and ground-borne noise, and potential impacts resulting from construction and operation of the Selected Alternative.

Impacts from the Selected Alternative due to ground-borne vibration from train passbys are not predicted to exceed the FTA *frequent* impact criteria at FTA Category 1, 2, or 3 land uses. No vibration levels high enough to damage buildings (including fragile historic buildings) are estimated from operations. Humans can sense vibration at approximately 65 velocity decibels (VdB). Vibration levels between 0 and 65 VdB are anticipated for areas within approximately 500 feet of the proposed track centerlines. Some locations directly adjacent to the surface tracks near the south portal will have estimated vibration levels between 65 and 72 VdB. Typical background vibration levels in residential areas are usually 50 VdB or lower.

Ground-borne noise is the noise radiated from the motion of room surfaces. When buildings vibrate, they can emit a noise or rumble known as ground-borne noise which may be perceptible to people inside them. Ground-borne noise levels under the Selected Alternative from train passbys are predicted to exceed the FTA *frequent* impact criteria at 444 residences and other FTA Category 2 land uses. Exceedances of the FTA ground-borne noise impact criteria are predicted at five Category 3 land uses (institutions) with the Selected Alternative. More detailed vibration analysis and monitoring will occur during the final design stage. The Selected Alternative will implement vibration control measures to mitigate the ground-borne noise impacts in exceedance of FTA frequent impact criteria.

Vibration will be generated from construction activities from the Selected Alternative, with potential impacts on surrounding areas near the proposed portals and above the proposed tunnels. TBM tunneling will be used to bore the four primary train tunnels. During construction, TBM vibrations will generally be between 0.04 and 0.2 inches per second PPV (peak particle velocity) for the Selected Alternative, and thus are not likely to risk damaging buildings near or above the proposed tunnels but will be perceptible to humans. The TBM will advance around 30 feet per day, meaning the vibration source will likely be felt for a day or two before the vibration source moves away from a given location. The range of PPVs estimated here will be comparable to the vibration (but not the noise) of a truck traveling 20-30 feet away from an observer.

Drill and blast excavation will be used to construct cross-passages and ancillary underground structures. Controlled blasting, unlike TBM vibration, is a transient vibration. No vibration levels will exceed 0.5 inches per second, the level at which damage is likely to occur to old residential buildings in poor condition. The PPVs will generally range between 0.07 to 0.4 inches per second. The threshold for human perception is approximately 0.02 inches per second, however, such vibrations are likely to be barely perceptible.

The evaluation of blast-induced vibrations for shaft construction is anticipated to have the most impact to the public. One shaft will be located at the Intermediate Ventilation Facility, and one at the North Ventilation Facility. Anticipated PPV vibration levels will be less than approximately 0.25 inches per second and thus below 0.5 inches per second, the typical threshold level of potential damage to historic structures. Recorded data from past blasting activities in similar conditions can be used to estimate potential order of magnitude of air overpressures, measured in decibels (dB). Overpressure is a sudden increase in air pressure, resulting from blasting. Based on this data, overpressure levels could range from about 102 to 145 dB at adjacent structures, without considering potential mitigation measures. For the purpose of comparison, 100 dB is like the approximate overpressure from a motorcycle, and 145 dB will be roughly equivalent to a fire cracker. Residents and businesses near construction areas will be notified in advance of blasting activities during construction.

K. Energy

Daily energy consumption by Amtrak trains in terms of British thermal unit (Btu) per passenger mile will increase an estimated 247 percent over existing levels due to the increased capacity and longer travel distance of the Selected Alternative. Energy consumption by MARC trains will increase an estimated 228 percent over existing conditions. Although energy consumption will increase under the Selected Alternative, the forecasted increase in daily passenger trips includes passengers diverted from other, less energy efficient modes of travel, such as single-occupant automobiles. However, these potential diversions from less energy efficient modes of travel are speculative. More information on this energy consumption analysis is included in the FEIS.

L. Construction

Construction impacts associated with construction of the Selected Alternative will include localized impacts at the mucking shaft and portal cut-and-cover locations, emissions and dust from construction vehicles, blasting noise and vibration near tunnel portal and ventilation shaft locations, temporary interruptions to vehicular and pedestrian traffic, temporary loss of on-street parking, and major utility relocations. Demolition of buildings, clearing land, and other construction activities could displace and increase activity from urban rodents, including rats. Disposition of the existing tunnel could also impact any bat populations present.

Construction staging areas for the Selected Alternative will be located adjacent to the north portal, south portal, and ventilation facilities. Construction staging areas will include facilities such as materials storage and lay down areas, water treatment, parking, power generation, offices, and others. Construction staging for the south portal and south ventilation facility will be primarily to the east and west of the proposed trench and cut-and-cover areas, within the limits-of-disturbance and existing Amtrak right-of-way. At the intermediate ventilation facility, construction staging will be confined to the site limits. The north portal construction staging area will be located

between the existing light rail tracks and the Jones Falls waterway, in the vicinity of North Avenue, Howard Street, and CSX Bridges over Jones Falls. Construction staging for the north ventilation facility will occur within the I-83 loop ramp area, currently in use as a Baltimore City Department of Transportation facility.

Construction activities will result in temporary interruptions to both vehicular and pedestrian traffic patterns, including temporary closure of roads and sidewalks. During various stages of construction, additional traffic will be generated by hauling of construction debris, excavation spoils, and building materials. Movement of trucks and heavy equipment will be limited to major thoroughfares to the extent practicable. Increased traffic, noise, and vehicular emissions along waste-hauling routes will likely occur as the muck material is trucked to appropriate waste facilities. The truck haul routes for the south portal construction area will run along Monroe, Pulaski, Payson, Lanvale, and Brice streets in order to connect the south portal construction staging areas to U.S. 40. At the north portal and north ventilation facility construction area, trucks will utilize Falls Road, North Charles Street, Maryland Avenue, and West North Avenue in order to access I-83. Truck haul routes for the intermediate ventilation facility will utilize Linden Avenue and West North Avenue to access I-83. Frequency of trips or waste destinations are not yet known at this phase of the Project.

M. Indirect and Cumulative Effects

1. Indirect Effects

The Selected Alternative could indirectly result in changes in land use, population density, or growth rate in Baltimore City but any effects would likely be relatively minor. Given the City's plans for redevelopment at the West Baltimore MARC Station and Baltimore Penn Station, any growth-inducing effects of this improved service would be beneficial in working towards Baltimore City's goals of fostering transit-oriented development and regaining population lost in previous decades. Information on the Penn North and West Baltimore MARC Station Area Master Plans, along with other relevant planning initiatives included in the Indirect and Cumulative Effects (ICE) analysis, can be found in Chapter VI of the FEIS. Efforts to redevelop and enhance the West North Avenue corridor in this vicinity are reasonably foreseeable. Furthermore, direct visual impacts from the proposed Intermediate Ventilation Facility could indirectly affect future development by influencing the general character and cohesion of the surrounding blocks along the West North Avenue corridor, Reservoir Hill, and the adjacent Bolton Hill neighborhood.

At present, there are no indications from NS that existing freight levels through the tunnel will change from existing conditions. CSX has trackage rights but no CSX freight trains currently use the B&P Tunnel due to lack of connectivity, clearance issues, and other constraints along the NEC through Baltimore and there no indications from CSX that this will change. It is up to the freight railroads to determine if using the B&P Tunnel is reasonable within the context of their overall operating strategies and rail networks, and then whether Amtrak can accommodate the movement in a timeframe that meets the freight railroad needs without interfering with Amtrak operations. More information on freight can be found in **Section IV.P**.

The Selected Alternative will result in a substantial and beneficial indirect effect to transportation. The alternative would result in downstream improvements to the efficiency of passenger rail service along sections of the NEC north and south of Baltimore as a result of the removed travel bottleneck. Indirect effects could also include changing travel behavior from automobile, air travel, and bus to passenger rail, thus promoting more energy efficient transportation.

2. Cumulative Impacts

The recently announced Baltimore City initiative known as Project CORE (Creating Opportunities for Renewal and Enterprise) will involve demolition of vacant, blighted houses in various locations throughout Baltimore City, including many in close proximity to the Selected Alternative. The Selected Alternative will require demolition

of 22 residential structures, resulting in a cumulative impact when added to the demolitions occurring under Project CORE.

Direct community impacts such as displacements, noise, and visual impacts resulting from the Selected Alternative will be similar in nature to those resulting from construction and operation of the U.S. 40 highway. Creating a new trenched transportation corridor in close proximity to affected portions of the Midtown-Edmondson neighborhood will cumulatively add to the past, present, and future impacts occurring as a result of the highway project. These cumulative impacts will occur in areas identified as low-income and/or minority population areas.

N. Irreversible or Irretrievable Commitments of Resources

The construction of the Selected Alternative will require the commitment of natural, human, and monetary resources. Construction materials such as wood, steel, fossil fuels, cement, aggregate, and bituminous material will be irretrievably expended during grading, tunneling, and track construction. Construction of the Selected Alternative will require a one-time investment of federal funds, and potentially state and local funds. The commitment of these resources is based on the recognition that residents in the area, state, and region will benefit from the improved quality of the transportation system. These benefits will consist of improved accessibility and mobility, travel time savings, and greater availability of quality services that are anticipated to outweigh the commitment of these resources. The Project will also replace an aging and outmoded transportation facility with a new facility featuring modern safety features. Furthermore, improved rail service will support more energy efficient transportation. Amtrak ridership at Baltimore Penn Station was approximately 1,066,000 in 2013, making it the eighth busiest station in Amtrak's national network (Amtrak, 2014).

O. The Relationship between Local Short-Term Uses and the Maintenance and Enhancement of Long-Term Productivity

Construction activities associated with the Selected Alternative will have short-term and construction effects related to the following items:

- HM and waste disposal;
- Water quality (erosion and sedimentation, and/or potential fuel and lubricant spills);
- Air quality (equipment emissions and fugitive dust);
- Noise and vibration (construction equipment);
- Property acquisition; and
- Traffic and pedestrian delays and detours.

In addition, short-term employment, use of materials to construct the Project, and purchases of goods and services generated by construction could create a short-term improvement in the local economy that will diminish once the construction is completed. For more information on potential economic effects, see **Section IV.A**.

Any short-term uses of human, physical, socioeconomic, cultural, and natural resources (i.e., the estimated five to seven-year period of construction) will contribute to the long-term productivity (i.e., the more than 100-year life span estimated for the new tunnel), including benefits of improved travel times, safety, operations, and reliability along the NEC corridor. Since the Northeast Corridor Improvement Program era 1976 – 1980, Amtrak has been making incremental improvements to increase speed and reduce travel time for train passengers for nearly 40 years. These improvements have cumulatively delivered significant changes in the inter-city rail experience, amounting since 1980 to between a one-hour and a one-and-one-half-hour reduction (Regional vs.

Acela) of the travel time between NYC and Washington, D.C. The continuing improvement of rail service to Baltimore will help to efficiently deliver passengers to Baltimore and support the future economic vitality of the City.

P. Freight

This section provides a summary of information regarding current and prospective future freight rail use of the B&P Tunnel. FRA has included this section to summarize and supplement the information previously presented in the DEIS and FEIS. The information is included in response to public comments and questions regarding freight rail received since the FEIS was published. New clarifying information has also been added regarding movement of HM in response to public comments.

1. Existing Conditions

Two freight railroad operators, NS and CSX, currently have the right to run freight along the NEC in Maryland: CSX has limited rights to operate up to four long-haul trains daily (and uses none), while Norfolk Southern (NS) has unrestricted rights, and runs two local freight trains each weekday (one round trip) between Bayview Yard north of Baltimore Penn Station and local Baltimore customers south of the B&P Tunnel. CSX currently does not exercise its rights to use the B&P Tunnel partly due to lack of connectivity, clearance issues, and other constraints along the NEC through Baltimore, but also because they have their own tracks, which makes the B&P Tunnel redundant to their infrastructure. (See **Section IV.P.4** below for further discussion of clearance issues along the NEC). CSX must also pay fees to Amtrak to use the NEC, making it more costly to use than tracks that they own. Other than the two weekday NS trains (one round trip), all other freight on the NEC originating in or destined to Baltimore is routed away from the existing B&P Tunnel on alternate routes that offer more competitive clearance conditions and fewer conflicts with passenger train services (Amtrak and MARC commuter trains).

Within the limits of these trackage rights agreements, Amtrak has statutory and contractual obligations to permit the continued operation of freight trains on the NEC and through the B&P Tunnel, although such freight traffic may not interfere with passenger train operations or schedules. These obligations apply regardless of whether the Selected Alternative is implemented; should either CSX or NS ask to operate trains through the existing tunnel, Amtrak would be obligated to accommodate those requests provided that the freight trains do not unduly conflict with passenger train schedules.

Freight railroads have a Common Carrier Obligation to their customers, which requires that they agree to service reasonable requests to transport customers' freight shipments, including any HM that can legally be shipped by rail under USDOT regulations. All freight operations are subject to safety provisions governing container durability standards, carrying restrictions, training, and safety and security plans for each shipment. USDOT safety provisions for hazardous material transportation go further, and include specific rules regarding labeling and placarding, time-of-day restrictions, specifications for tank cars, and general requirements and packaging specifications, among others. First responders such as local fire, police or environmental personnel, or railroad personnel receive training in HM response for specific facilities, including the B&P Tunnel.

The significant existing volume of passenger trains on the NEC generally confines freight shipments to off-peak and night hours; these time windows will be under pressure and will likely become further constrained if future passenger traffic continues to increase as is forecast over the next 25 years. The times at which freight trains can move on the NEC is critical for high-priority freight shipments, and therefore these time constrains may limit freight railroads future potential use of the NEC.

Even if there remain adequate time gaps between passenger trains to permit the insertion of slower freight trains, in light of current track configurations, CSX trains would require operation on over 125 miles of the NEC from Philadelphia, PA to Landover, MD in order to use the new tunnel or would require the construction of very costly new track connections north and south of the tunnel to connect its existing track closer to the new tunnel.

NS currently favors a different route (Harrisburg-to-Perryville) for its through-freight-rail shipments originating or destined to the Baltimore area. NS accesses the Port of Baltimore via the NEC from the North (i.e. Perryville). Only shipments between Bayview Yard and the local customers south of Baltimore now being served on the NEC require use of the B&P Tunnel by NS trains.

In sum, even with the Selected Alternative, private freight rail companies may continue to prefer various alternative routes they own and operate over use of the NEC through Baltimore. For example, in 2016, CSX announced plans to improve the clearances of the Howard Street Tunnel it owns in Baltimore. When these improvements are completed, it will provide CSX (and possibly NS) with a route through Baltimore City able to accommodate virtually any size of rail car operated in the United States and Canada and may make prospective use of the NEC through Baltimore for freight even less appealing.

2. Hazardous Materials (Current Operations)

Freight railroads are considered "Common Carriers," and fall under the jurisdiction of the Surface Transportation Board (STB), a federal agency charged with regulating the nation's rail operations. The Common Carrier obligation both permits and requires transport of HM by the nation's freight railroads: as noted above, a freight transportation company cannot refuse a reasonable request by a shipper to move material by rail, including HM as permitted by law.

Notwithstanding that HM transported through the nation's rail tunnels is permitted, the likelihood of a release of such material is small and, should one occur, the design of the Selected Alternative would reduce the threat to surrounding areas and their inhabitants compared with the same event occurring in the existing B&P Tunnel or in open air, since the existing tunnel makes no provision for control of released liquid or gaseous HM (see **Section IV.P.6** below for more detail). The larger tunnel bores included in the Selected Alternative are not anticipated to change the likelihood of hazardous material shipments, compared with the existing tunnel. HM can be transported in a variety of rail cars. It is not the existing tunnel's smaller size or slower speed that prevents large-quantity hazardous material shipments; standard tank cars fit through the existing B&P Tunnel without difficulty.

Hazardous material transport is a highly regulated activity in the U.S. Rail carriers are required to have shipping documentation and update physical position of HM entrained. HM regulations (HMR; 49 C.F.R. Parts 10-185) provide requirements for packaging, including materials types, thickness and closures for boxes, barrels or totes and for bulk shipments in rail tank cars. These packaging requirements undergo intensive testing requirements to assure the prevention of releases through conditions typically (and sometimes not-so-typically) encountered in transportation.

To address the risks posed by such materials, the HMRs require marking and labeling of the vessels in which they are carried, using placards affixed to the truck or train car colored and coded to indicate the material in transport. This information translates quickly into the types of risks the material may impose if leaked to the environment. These markings, labels and placards give first responders critical information as to the type of risk posed by the contained material, and the appropriate response, or whether a locale should be evacuated.

In addition to placarding, shippers must have training in the securing of valves and fittings, handling and response to the release of such materials, and they must refresh their training annually to be able to transport such materials. Both railroads and shippers must also alert first responders of the quantity and type of material carried, and the means of transport as they approach a locale. They must also coordinate in the preparation of a spill plan that defines roles and responsibilities of train or truck crews and local first responders (fire, police, environmental) in responding to a release of the material to the air, soil or water. In addition, HM releases are reported to a DOT database used to analyze spills and accidents to improve the HMRs based on real-world experiences.

When HM are released to the environment after a truck or train accident, rapid response is required. Most local fire and police forces are trained in such response, as are environmental personnel from local and state environmental regulatory agencies. In many cases, railroad personnel and truck drivers themselves may be trained and partially equipped for initial response to a release, to begin the process of controlling the release while awaiting local response personnel and heavier equipment. Class 1 railroads like NS or CSX would have HM Managers on the scene of an incident.

3. Potential for Future Increase in Freight Rail

While the Selected Alternative does increase passenger train capacity through the tunnel by doubling the number of tracks, the construction of the tunnel itself would not be likely to induce significant additional freight traffic through the tunnel. This is because the differential in speed and length of trains are primary factors dictating the ability of dispatchers to interweave slow and long freight trains among the much faster moving passenger trains that share the tracks. Because of their operating characteristics, freight trains require very long gaps between passenger trains before they can be seamlessly inserted into the train traffic on a particular track. Increasing the number of tracks over this short section of the NEC will not reduce the requirement to interweave the freight trains among the scheduled passenger trains operating over the entire length of the NEC unless dedicated freight tracks are constructed. Few such time gaps exist in the current schedule, and fewer still are anticipated to exist in the future as passenger train volumes increase over time, particularly south of Baltimore to Washington, DC.

Even with increased capacity in a modernized B&P Tunnel, additional infrastructure investment along the NEC and connections to the regional freight network would be required to accommodate future potential growth in freight traffic.

4. Maintaining Future Options/Flexibility

Double-stack freight trains are highly energy efficient by using specially designed cars on which two standard shipping containers are stacked, one on top of the other. These trains are approximately five feet taller than normal freight trains (20'-3" tall vehicles, 26'-9" including catenary wire clearance for electric trains), and therefore require five feet more vertical clearance compared to historical rail equipment dimensions to the underside of bridges, overpasses, signal trusses and other infrastructure that spans the rail right-of-way. Double stack container freight cars are known as AAR (Association of American Railroads) "Plate H."

The Selected Alternative is optimized for passenger train operations while not precluding the use of the tunnel by a limited number of freight trains. The existing B&P Tunnel was not designed for double-stack trains, as they had not yet been invented when the tunnel was built. With the introduction of such trains over the past 30 years, however, FRA now recognizes the value of designing new infrastructure elements (i.e., bridges, tunnels) so as not to preclude the use of double-stack freight trains in the future.

Once it is built, the new B&P Tunnel cannot be enlarged to accommodate bigger equipment at some future date. Because of the likely century-long life of the Selected Alternative (the current tunnel has lasted 144 years), providing for future double-stack intermodal freight use is prudent; failing to provide for this traffic should it become important at some time over the next 100+ years would be shortsighted, since it is not possible to predict the ebb and flow of future port and NEC economic activity and associated freight movement. The Selected Alternative therefore is designed to accommodate double-stack (Plate H) container freight cars, which could only operate through the tunnel if future projects are proposed and advanced to clear a double-stack route over the NEC on either side of the tunnel. No such projects are currently planned or proposed.

The NEC does not currently feature sufficient vertical clearance to allow double-stack operation in most other places, even if a new B&P Tunnel will accommodate double-stack. As a result, double-stack freight trains would not be able to use the Selected Alternative and the NEC in Baltimore unless other impediments are rebuilt to

higher vertical clearances; as many as 145 overhead structures would have to be evaluated north and south of the tunnel, and without additional investment in the hundreds of millions of dollars (which are neither currently programmed nor available), it is unlikely that double-stack trains will operate through Baltimore on the NEC anytime in the near future. However, should additional vertical clearance projects be proposed and advance, and a market for larger-dimension freight trains emerge along the NEC, the FRA has determined that the Selected Alternative should not preclude that future traffic.

5. Air Quality

As described in **Section IV.H** above, Amtrak uses only electric trains which do not directly generate emissions. MTA announced plans in August 2015 to replace its electric MARC locomotives with an all-diesel fleet, and all increased emissions predicted under the Selected Alternative would be the result of diesel MARC trains.

While it is not possible predict the future demand for freight rail service and therefore not possible to precisely forecast future freight rail traffic, FRA recognizes the public's concern over possible degradation of air quality if the Selected Alternative were to unexpectedly attract additional diesel freight trains. The following rough analysis is not an attempt to predict future freight traffic, but rather to identify how much total freight traffic would need to increase before there would be a measurable impact on air quality in surrounding communities.

Of the seven regulated air pollutants, diesel locomotives generate significant amounts of only two: nitrogen oxides (NO_x) and particulate matter (visible soot and fine respirable particulates). While it is not possible to forecast future freight rail traffic, it is possible to estimate the approximate growth in freight traffic through the B&P Tunnel that would cause an exceedance of the applicable *de minimis* thresholds for NO_x and $PM_{2.5}$. This estimate assumes that regional (long-haul) freight trains would each use six locomotives[5], local freight trains would each use two locomotives, each locomotive would have the same emissions profile as a diesel passenger train locomotive, and freight locomotives would move at approximately 30 mph through the tunnels.[6] Based on these assumptions, every ten additional freight trains would emit diesel emissions approximately the equivalent of 104 additional diesel passenger trains[7]. Ultimately, to exceed the de minimis thresholds for NO_x and $PM_{2.5}$ at the Intermediate Ventilation Facility, one would need to assume a market for – and NEC track and signal capacity sufficient to accommodate – approximately thirty-four times more freight traffic than currently operates through the existing tunnel. This would be about 68 freight trains daily, in addition to the two (one round trip) that occur now.

The NEC could not accommodate 68 additional freight trains under any signal-control scenario or without significant and unacceptable disruption to current and projected future passenger train services. Recent Amtrak estimates of the capacity of the NEC to absorb additional freight train operation are for 3-4 additional trains each night, far fewer than the 68 trains that would have to operate each day before the *de minimis* threshold for the pollutants of concern from diesel locomotives would be breached. And based on recent historical activity and current plans, it is unlikely that there is market for, or the available equipment sufficient to operate, that much additional freight rail service in the greater Baltimore area. Therefore, it is concluded that the Selected

[5] This analysis is conservative in assigning six locomotives per long-haul freight train; most long-haul trains typically require fewer than six locomotives to address car loads and speed requirements.

[6] The concentration of pollutants in air are generally inversely proportionate to vehicle speed: the slower the vehicle moves, the more concentrated the pollutants in the air through which it is passing; the faster it moves, the less concentrated these pollutants.

[7] This analysis does not assume improving locomotive emissions performance over time; current Clean Air Act regulations obligate the next generation of locomotives to significantly lower levels of emissions than those that operate currently.

Alternative will neither cause nor contribute to a violation of NAAQS for any of the seven criteria pollutants[8] under any feasible operating scenario over the NEC tracks north and south of the B&P Tunnel.

Further, in 2016, freight railroads began using new diesel locomotives complying to "Tier IV" emissions limitations which dramatically reduce released pollutants. The percentage of Tier IV vehicles will continue to increase as railroads retire their older locomotives over their typical 20-25-year life.

6. Hazardous Materials (Future)

As mentioned previously, freight railroads are considered "Common Carriers." The Common Carrier obligation both permits and – upon request by a shipper – necessitates the transport of hazardous materials by the nation's freight railroads.

Notwithstanding that hazardous materials transport through the nation's rail tunnels is permitted, the likelihood of a release is extremely small and, should one occur, the design of a new tunnel would result in less threat to surrounding areas and their inhabitants than if the same event were to occur in the existing B&P Tunnel or on the streets in open air, since only the Selected Alternative would offer the option to control the release via the ventilation system included in the design. Equivalent releases in the existing tunnel or from trucks operating on public thoroughfares would be completely uncontrolled, and would be subject to highly variable wind conditions, making it difficult to assess and respond to the threat the materials pose to surrounding areas.

HM can take either solid, liquid or gaseous form, depending how they are stored for transport, and whether they react with air upon release. When HM are in solid form, response to a release is relatively straightforward, involving the use of appropriate handling and protective equipment by responders. When a release is in liquid form, it will be captured in the tunnel drain system, where it can be contained and removed manually and treated for transport away from the area of the spill, and disposed. Where liquids are accompanied by or emerge from a tank as gases, or where a gas is shipped in its natural state in a pressurized tanker car, a release in the tunnel may either remain in the tunnel if the released gas is heavier than air[9], or it may rise out of the tunnel towards the portals if it is lighter than air. In both cases, the tunnel ventilation system gives responders a degree of control and an ability to manage both exposure to the release and removal of the offending material that would not be available in a tunnel with only passive ventilation or if the material were released above ground.

The ventilation system allows the use of fans on either low or higher speeds to both push or pull the gaseous plume toward or away from particular points of release, which may offer a higher degree of control than would be available were the release to occur in open air at street level. The vent system can also dilute the offending gas with fresh air drawn into the tunnel to the area where the gas is known to be most concentrated, potentially reducing its toxicity. Thus, the ventilation system gives responders some ability to manage potential exposure of people, animals, and property to the released material. With the dual capabilities of dilution and flow direction, modern tunnels can improve the management of spilled materials, contain the material away from residential areas, and generally permit a faster and more precisely targeted response. For a tunnel without ventilation equipment (such as the existing B&P Tunnel), or if material is spilled in the open streets of a town or city, prevailing winds will generally dictate how a gas cloud or a fire will resolve, and the decision whether and where to evacuate can be much more complicated as winds shift.

The benefits of a modern tunnel (such as the Selected Alternative) as concerns management of hazardous material releases and their potential effect on communities are that the tunnel will contain an explosion or fire/smoke condition and permit direction of the heat and smoke to the point of least impact, whether that is

[8] The air pollutants regulated by the federal Clean Air Act – carbon monoxide, oxides of nitrogen, ozone, airborne lead, sulfur dioxide, and particulate matter are termed "criteria pollutants." Particulate matter (PM), is regulated at two levels of particle size, 10 micron and 2.5 micron (fine respirable particulates).

[9] If the released gas is heavier than air, it will remain at the bottom of the tunnel, since the tunnel reaches its deepest depth at its center, to pass beneath the Baltimore city subway tunnel that runs beneath Pennsylvania Avenue.

the portals or one or more of the three ventilation facility louver systems. The tunnel also has pollutant monitoring systems that detect pollutants and signal their location.

Modern rail systems, while not infallible, are expected to have fewer hazmat releases as time passes. Historically, such releases have been a function most often of aging containers, hoses, piping connections and the like. In a very few cases, however, trains have slipped their brakes or derailed on curves, leading to catastrophic releases. The current regulatory requirement for train speed control systems on all freight and passenger equipment by end of 2018 (already completed on the Amtrak-owned portions of the NEC) are expected to reduce the frequency of such instances still further. In the particular case of the NEC and the B&P Tunnel, rail sidings leading to the NEC both north and south of West Baltimore are topographically isolated from the project area: the siding tracks grade away from the tunnel, and gravity will therefore keep cars whose brakes have slipped from rolling towards the tunnel. Finally, the nearest yard where freight cars are picked up or set off are either several miles north of Baltimore Penn Station or far south of the south portal, and therefore even if trains were to slip free, they would not threaten residential areas near the tunnels. Building the tunnel does not change in any way the potential for such incidents elsewhere on the rail network.

V. MITIGATION

Impacts that would result from the Selected Alternative will be mitigated through the implementation of mitigation measures. The mitigation measures included in this ROD are final commitments, and FRA would require them to be implemented with advancement of the Project into final design and construction by any agency or entity seeking funding from FRA to support Project implementation. Through a combination of these mitigation measures and the refinements to the alignment made since the DEIS, FRA has ensured that all practicable means to avoid or minimize environmental harm from the Selected Alternative have been adopted. **Table 8** provides a description of these mitigation measures and the impacts they are intended to address.

For clarity, the table groups the mitigation measures into categories, including Outcome Monitoring, Community, Economy, Transportation, Natural Resources, HM/Emergency Management, Construction, Operational Air Quality, Operational Noise, Operational Vibration, and Cultural Resources. The mitigation measures would be implemented during design, construction, and after construction of the Selected Alternative. More detail on the mitigation items related to cultural resources can be found in the PA included in **Appendix B.**

One new mitigation measure has been added since the publication of the FEIS. In response to public comment received at the December 2016 FEIS Community Information Meeting, FRA and MDOT have agreed to assess the presence of bat populations in the existing B&P Tunnel, and consider impacts to bat populations in the tunnel's disposition (see measure 21 below).

Table 8: Mitigation Measures

No.	Mitigation Measure/Project Commitment	Relevant Impacts Mitigated
Outcome Monitoring		
1	FRA, or another lead agency as determined by future project responsibility, will monitor the outcomes and effectiveness of mitigation efforts by implementing detailed tracking procedures and public reporting.	All
Community		
2	The Selected Alternative will include establishment of a fund to support community development within affected communities. Examples of community development activities include economic development projects, installation of public facilities, community centers, public services, small	Community facilities, community cohesion,

No.	Mitigation Measure/Project Commitment	Relevant Impacts Mitigated
	business assistance, homeowner assistance, community broadband Wi-Fi internet access, and others. The fund will provide funding to not-for-profit community development organizations that serve communities within the corridor for operating expenses and capital projects. Funds will be awarded, based on published criteria, to organizations that are active within 1/4 mile of the Project alignment. Projects that are explicitly included under other mitigation measures, such as park improvements, will not be eligible for mitigation under this measure.	neighborhoods, environmental justice, land use, residential, business, cultural/historic
3	The Selected Alternative will include the provision of relocation benefits to property owners and tenants pursuant to the Uniform Relocation Act.	Residential, business, environmental justice
4	The Selected Alternative will include establishment of a fund for maintenance of, and improvement to, publicly-owned parks and recreation facilities within affected communities. Parks and recreation facilities receiving funding should be located within 1/4 mile of the Project alignment.	Community facilities, environmental justice, community cohesion, neighborhoods
5	The Selected Alternative will include visual screening of ventilation facilities adjacent to schools and other community facilities.	Community facilities
6	The Selected Alternative will include funding to support the improvement or establishment of community gardens, vacant lot greening, and/or the establishment or improvement of public open space within 1/4 mile of the Project alignment.	Community facilities, street trees, stormwater, visual, community cohesion, neighborhoods, land use
7	The Selected Alternative will include a mechanism for public comment in the design and landscaping of Project facilities such as portals, ventilation facilities, and other visible Project structures.	Visual, cultural/historic
Economy		
8	The Selected Alternative will provide coordination with local job training organizations to 1) facilitate targeted job training by providing estimates of the type, number, and timing of jobs expected to be created by project contractors, 2) include goals for nationally-targeted workers of social and economic disadvantage in construction contracts, and 3) require project contractors to report their progress in meeting contract goals on a regular basis. The Project will provide public reporting on job creation.	Environmental justice, business
Transportation		
9	The Selected Alternative will include funding for streetscape infrastructure, pedestrian, and bicycle access improvements within 1/2 mile of the Project alignment with emphasis on access to the West Baltimore MARC Station. Examples include landscaping and street trees, bus stop facilities, benches, trash receptacles, lighting, sidewalk repairs, bike lanes, cycle tracks, crosswalk striping and signaling, traffic calming measures, ADA accessibility, and/or public art.	Street trees, stormwater, visual, transportation, community cohesion, neighborhoods

No.	Mitigation Measure/Project Commitment	Relevant Impacts Mitigated
10	The Selected Alternative will include development of a Traffic Plan that provides protection for safe pedestrian, bicycle, and vehicular movement around work sites during construction and maintains connectivity, where possible. The plan will account for truck haul routes, construction traffic concerns, and municipal solid waste pick-up, and should help minimize transportation impacts during construction. The plan should account for community resources such as schools and parks.	Transportation, community cohesion, neighborhoods, construction, traffic, community facilities, noise
11	The Selected Alternative will include stabilization and securement of the existing B&P Tunnel for potential future rail transportation use.	Transportation
12	The Selected Alternative will include the replacement of all impacted station facilities at the West Baltimore MARC Station, and reconstruction of the facility in compliance with the ADA.	Transportation, visual, community facilities, cultural/historic
13	The Selected Alternative will include additional reasonable amenities at the West Baltimore MARC Station beyond those that currently exist, and beyond those that would need to be replaced in-kind as a result of direct impacts to the Station from the Project. Amenities such as security lighting, technological updates, full platform canopies, or public art may be considered in coordination with MARC and MTA.	Transportation, visual, community facilities
Natural Resources		
14	The Selected Alternative will include the development and implementation of a Stormwater Management Plan in accordance with MDE guidelines. The plan will focus on stormwater runoff associated with construction activities and surface impacts, both temporary and permanent, throughout the Study Area.	Stormwater, construction
15	The Selected Alternative will include development and implementation of an Erosion and Sediment Control Plan for construction activities.	Stormwater, construction
16	The Selected Alternative will include implementation of vegetative buffers to screen right-of-way along the NEC in the Study Area, and develop a mechanism for maintenance of vegetative buffers.	Visual, stormwater
17	The Selected Alternative will include implementation of a Rodent Abatement Plan.	Construction
18	The Selected Alternative will include the development and implementation of a Street Tree Protection Plan and a Forest Conservation Plan.	Street trees
19	The Selected Alternative will include a plan for floodplain mitigation.	Floodplain
20	The Selected Alternative will include a Tunnel Sump Water Treatment and Disposal Plan.	Water resources
21	The Selected Alternative will include assessment of bat populations in the existing B&P Tunnel, and consideration of bat populations in the disposition of the tunnel as appropriate.	Habitat
HM / Emergency Management		
22	The Selected Alternative will include development and implementation of a Hazardous Spill Prevention Plan.	Hazmat
23	The Selected Alternative will include development of an Emergency Management Plan to be implemented in the event of a tunnel emergency.	Safety/hazmat, transportation
24	The Selected Alternative will include development of a Hazardous Materials Remediation Plan to remediate Hazardous Material sites impacted by the Project.	Hazmat

No.	Mitigation Measure/Project Commitment	Relevant Impacts Mitigated
25	The Selected Alternative will include development and implementation of a Screening and Materials Handling Plan for the pumping, segregation, transportation, and disposal of groundwater. Evaluation of any screening and sampling results by an environmental professional will determine health and safety, handling, and off-site disposal requirements.	Hazmat
26	The Selected Alternative will include implementation of a program for the identification and segregation of impacted soils for additional testing and off-site disposal. Evaluation of any screening and sampling results by an environmental professional will determine health and safety, handling, and off-site disposal requirements.	Hazmat
Construction		
27	The Selected Alternative will include development and implementation of a Construction Noise Mitigation Plan. The plan will include to the extent practicable: • Location of construction equipment and material staging areas away from sensitive receptors where possible; • Temporary noise barriers and advanced construction of permanent barriers to serve during construction where possible; and • Routing of construction traffic and haul routes along streets in non-noise sensitive areas where possible.	Noise, construction
28	The Selected Alternative will include development of a Construction Vibration Mitigation Plan to include the following measures: • Use of controlled blasting construction for vibration mitigation during drill and blast, and utilize blast covers when applicable. • Implementation of contractor control measures to ensure vibration from the TBM is kept low enough to avoid damaging buildings, including historic buildings, and remains below applicable FTA impact criteria. • Implementation of a vibration monitoring program and pre-survey of buildings in tunneling and blasting areas.	Vibration, construction, cultural/historic
29	The Selected Alternative will include development and implementation of a Construction Emissions Reduction Plan to include measures such as reducing equipment idling times, utilizing on-site storage to reduce truck haul trips, using low-emissions equipment, dust suppression measures, ensuring the contractor has knowledge of appropriate fugitive dust and equipment exhaust controls, and other measures. Construction activities undertaken as part of the Selected Alternative will be performed in accordance with Maryland's *Standard Specifications for Construction and Materials*, and COMAR 26.11.06.03D – *Fugitive Particulate Matter from Materials Handling and Construction.*	Air quality, construction
30	The Selected Alternative will include utilization of public information and feedback methods such as construction-alert publications and complaint hotlines to address issues and keep the public informed. Notifications will include information about construction schedules, road closures, transit service impacts, blasting, and contact information.	All construction related
Operational Air Quality		

No.	Mitigation Measure/Project Commitment	Relevant Impacts Mitigated
31	The Selected Alternative will include vertically-oriented fans at ventilation facilities to facilitate dispersion of emissions from locomotives and avoid violation of air quality regulations.	Air quality
Operational Noise		
32	The Selected Alternative will include noise barriers to mitigate anticipated operational noise impacts. Ventilation facilities will be designed with noise attenuation measures.	Noise
Operational Vibration		
33	The Selected Alternative will include implementation of operational vibration control measures to mitigate modeled vibration or ground-borne noise impacts exceeding FTA Frequent Impact criteria. Potential mitigation measures to consider during design include: • Resilient fasteners • Ballast mats • Resiliently supported ties • Floating slab track • Rail vibration absorbers/dampers	Vibration
Cultural Resources and Historic Properties		
34	The Selected Alternative will include the establishment of a preservation grant fund to address adverse effects to historic properties.	Cultural/historic
35	The Selected Alternative will include context-sensitive design treatments for new construction informed by the features of the affected historic properties.	Cultural/historic
36	The Selected Alternative will include sound barriers and/or vegetation to ensure that relevant historic properties are screened, including contributing elements of historic districts.	Cultural/historic
37	The Selected Alternative will include a Historic Properties Construction Protection Plan designed to protect above- and below-ground known historic properties from adverse effects during construction activities. Additional provisions of the PA will provide for identification, evaluation, and treatment of unknown cultural resources, unanticipated discoveries, and human remains. The Plan will also address vibration monitoring, stockpiling, and truck routes/hauling.	Cultural/historic
38	The Selected Alternative will include preparation of written and photographic documentation, consistent with Level II Historic American Buildings Survey (HABS) / Historic American Engineering Record (HAER) standards, for deposit with the MD SHPO for historic properties, including contributing elements of historic districts, directly and adversely affected.	Cultural/historic
39	The Selected Alternative will include preparation of interpretive material including signs and/or displays and brochures to be located in Baltimore's Pennsylvania Station. Possible themes may include the history of the B&P Tunnel, history of the North Avenue corridor, history of the Pennsylvania Railroad and Pennsylvania Station, influence of railroads on Baltimore City, and/or archaeological findings in the Project area as relevant.	Cultural/historic
40	The Selected Alternative will include an investigation of the history, development, use, and evolution of the station facilities and yards comprising present-day Pennsylvania Station in Baltimore City for the purposes of	Cultural/historic

No.	Mitigation Measure/Project Commitment	Relevant Impacts Mitigated
	clarifying and delineating the official boundaries of railroad-related NRHP-listed and eligible historic properties.	
41	The Selected Alternative will include measures for securing, salvaging, stockpiling, and reusing of building materials from the demolition of historic properties and contributing elements to historic districts.	Cultural/historic
42	The Selected Alternative will include the addition to the existing Project website of a new section on cultural resources that will provide a platform for the electronic storage and public dissemination of information on Project activities and findings related to historic architecture and archeology.	Cultural/historic
43	The Selected Alternative will include the completion of a Phase I Archaeological Survey sufficient to identify archaeological resources that may be affected by the Project. A Phase II archaeological survey will be conducted to evaluate the identified resources for NRHP eligibility. If an adverse effect cannot be alternatively mitigated, the Selected Alternative will include a Phase III Data Recovery for each adversely affected NRHP-listed or eligible archaeological historic property.	Cultural/historic

VI. AGENCY, ELECTED OFFICIAL, AND PUBLIC COORDINATION

FRA and MDOT have encouraged agency and public input throughout the Project development. The purpose of this coordination is to inform stakeholders, increase awareness of public and agency concerns and interests, and consider that input in Project development. From scoping, to alternatives development, to the identification of a Selected Alternative, information received from agencies and the public has supplemented data collected by FRA and MDOT through desktop research and field visits. Comprehensive input from the public and agencies has aided in the identification of a Selected Alternative that both meets the Project Purpose and Need and minimizes impacts to the environment, to the extent possible.

The agency and public coordination process was implemented to be consistent with the CEQ NEPA regulations (40 C.F.R. §§ 1500-1508); FRA Procedures for Considering Environmental Impacts (64 FR 28545 [1999]); and FRA's Update to NEPA Implementing Procedures (78 FR 2713 [2013]). Agency and public coordination began in June 2014 with the scoping period at the initiation of the Project. The general public involvement process evolved as the Project advanced, a process which included the screening of the preliminary alternatives, the development and evaluation of alternatives carried forward, and the identification of the Selected Alternative. FRA and MDOT have incorporated public input throughout the process, making refinements to the alignments considered and relocating the Intermediate Ventilation Facility to minimize community impacts.

This section presents a brief summary of the agency, elected official, and public coordination and comments throughout the Project. More detailed information is available in the FEIS.

A. Scoping Period

The Project was first introduced to agencies and the public during the scoping period, which began with the publication of the Notice of Intent (NOI) in the *Federal Register* on June 9, 2014 and concluded with the end of the scoping comment period on July 30, 2014.

The primary goal of the scoping period was to introduce the Project to agencies and the public, and to gather input on the Project Purpose and Need and environmental resources. The scoping period also served to

determine and clarify issues that were relevant to the scope of the Project. During the scoping process, communication was established between the lead Project agency and Project grantee (FRA and MDOT, respectively) and government agencies, citizens, elected officials, community associations, and other interested stakeholders.

B. Agency Coordination

FRA and MDOT have encouraged agency input on the Project throughout Project development. The purpose of this coordination was to inform agency stakeholders, learn about agency concerns and interests, and use agency input in Project development. Information obtained from agency input has been used from Project scoping to engineering development and the environmental evaluation of the alternatives.

FTA served as a Cooperating Agency for the Project. Other federal and state agencies served as participating agencies and have been kept abreast of Project updates via the Project website, www.bptunnel.com, and regular Interagency Review Meetings (IRM) hosted by the Maryland State Highway Administration (SHA). The Project was presented to interested federal, state, and local agencies at seven separate IRMs between June 2014 and November 2016. Seventeen agencies were represented over the course of the process including, SHA, U.S. EPA, USDOT, MDE, USFWS, ACHP, the National Oceanic and Atmospheric Administration (NOAA), the Metropolitan Washington Council of Governments (MWCOG), U.S. Department of Housing and Urban Development (HUD), the U.S. Army Corps of Engineers (USACE), National Park Service (NPS), Maryland Department of Planning (MDP), MHT, FHWA, MDOT, the Baltimore Metro Council, and MTA.

FRA submitted the FEIS to U.S. EPA for review concurrent with its publication in November, 2016. In a letter dated December 27, 2016, U.S. EPA agreed that the FEIS had responded to their concerns regarding the DEIS. The letter stated that FRA should continue to work with MHT in developing a PA addressing the potential adverse effects to historic properties, and requested the final document be referenced or included in the ROD. The December 27, 2016 correspondence from U.S. EPA is included in **Appendix D**. The final PA is included in **Appendix B**.

C. Elected Official Coordination

FRA and MDOT have held regular meetings with local, state, and federal elected officials who represent the Study Area. During the preliminary alternatives development in fall 2014, over 20 meetings were held with Study Area representatives in the U.S. Congress, Maryland legislature, Baltimore City Mayor's office, and Baltimore City Council. Elected officials were briefed on the status of the Project throughout its various stages, and were kept informed of public involvement efforts and public input. Letters were also sent to elected officials at key Project junctures, such as the publication of the FEIS, to provide updates on important Project information.

D. Public Involvement

FRA has advertised and held numerous public meetings and engaged in other public involvement activities throughout the NEPA process thus far. This section summarizes the public involvement activities held prior to the release of the FEIS, and provides an update on activities subsequent to the FEIS. More information is available in Chapter VIII of the FEIS.

Below is a complete list of public meetings held for the Project:

- Public Open House – June 19, 2014, Coppin State University
- Public Open House – October 29, 2014, Mount Royal Elementary School
- Community Meetings – April 2015
    - April 13, 2015 – Gilmor Elementary School
    - April 14, 2015 – Mount Royal Elementary School

  - April 20, 2015 – Westside Elementary School
  - April 21, 2015 – Lockerman Bundy Elementary School
- Public Open House – June 16, 2015, Carver Vocational-Technical High School
- Community Meetings – July 2015
  - July 7, 2015 – Perkins Square Baptist Church
  - July 14, 2015 – Mt. Lebanon Baptist Church
  - July 16, 2015 – Mount Royal Elementary School
- Community Meetings – October 2015
  - October 6, 2015 – Carver Vocational-Technical High School
  - October 13, 2015 – John Eager Howard Recreation Center
  - October 20, 2015 – Mount Lebanon Baptist Church
- DEIS Public Hearings – February 2016
  - February 1, 2016 – Frederick Douglass High School
  - February 6, 2016 – Frederick Douglass High School
  - February 17, 2016 – Carver Vocational-Technical High School
- Public Open Houses – April 2016
  - April 6, 2016 – Frederick Douglass High School
  - April 16, 2016 – Carver Vocational-Technical High School
- FEIS Community Information Meetings – December 2016
  - December 8, 2016 – Mount Royal Elementary School
  - December 10, 2016 – Carver Vocational-Technical High School

1. Public Involvement Prior to the FEIS

From the Project's NOI on June 9, 2014, through the alternatives development and evaluation that preceded the release of the DEIS, three Public Open Houses and ten community meetings were held. In addition to the Public Open Houses, FRA and MDOT hosted ten smaller-scale community meetings in April, July, and October 2015. These community meetings were implemented in an effort to be responsive to community needs, clarify community concern, and facilitate Project understanding among Study Area residents. The meetings provided opportunities for the public to both learn about the Project background and milestones, as well as engage with FRA and MDOT.

FRA and MDOT also attended several local Community Association meetings to present information on the Project and respond to questions in smaller, neighborhood-focused settings in 2015 and 2016. These community associations included the Alliance of Rosemont Community Organizations, Western District Community Council, Reservoir Hill Improvement Council, Residents Against the Tunnels, the No Boundaries Coalition, and the Midtown-Edmondson Community Association.

The release of the DEIS on December 18, 2015 initiated the DEIS comment period, which ran through February 26, 2016. The DEIS comment period provided agencies and citizens opportunity to submit formal comments on the DEIS. During the DEIS comment period, the FRA also held three public hearings where attendees could submit oral and written comments. A total of 132 citizens, elected officials, and organization and agency representatives attended the Public Hearings.

Following the end of the DEIS comment period, FRA hosted two public open houses on April 6, and April 16, 2016. The public open houses offered the community an opportunity to see how their feedback given during the DEIS comment period was incorporated into the alternatives development and environmental evaluation. These

Public Open Houses were attended by 81 citizens, elected officials, and organization and agency representatives. FRA and MDOT first identified the Preferred Alternative at these meetings.

In spring 2016, FRA and MDOT established a Mitigation Working Group to provide an opportunity for FRA and MDOT to work with community stakeholders and representatives to identify potential mitigation measures for the Project. The Mitigation Working Group consists of members of FRA and MDOT, community stakeholders, and representatives of twelve community associations. Two Mitigation Working Group meetings have been held thus far, on May 10 and May 31, 2016.

2. Public Involvement Subsequent to the FEIS

The release of the FEIS was announced via newsletter mailings and flyer postings, email notifications, website updates, letters to elected officials, and advertisements in several local papers including the *Baltimore Sun, City Paper, Afro-American,* and *Grace and Glory Magazine*. The U.S. EPA published the Notice of Availability for the FEIS in the *Federal Register* on November 25, 2016. Printed copies of the FEIS were made available to the public at ten locations during the FEIS waiting period, including libraries, recreation centers, and government offices.

Two Community Information Meetings were held in December 2016 to present information regarding the release of the FEIS, the Preferred Alternative, the preferred Intermediate Ventilation Facility Site, and potential mitigation measures proposed in the FEIS. The first meeting was held on December 8 from 6:00 pm to 8:00 pm at Mount Royal Elementary Middle School. The second was held at Carver Vocational-Technical High School on December 10 from 11:00 am to 1:00 pm.

Concerns raised at the two Community Information Meetings reflected many of the same comments received throughout the Project, formally presented as comments on the DEIS, and addressed in the FEIS. These concerns generally included the following:

- Inquiry about potential for damage to properties, process for inspecting or determining if damage has occurred, how property owners would be compensated, and whether funding for repairs or insurance has been identified.
- Concerns about potential for emergency events such as explosions or spills of HM, and whether modeling has been done to predict the potential outcomes of such events.
- Concerns about the location of the preferred Intermediate Ventilation facility, particularly the close proximity of an elementary school and potential for air quality impacts.
- Concerns about the air quality, noise, vibration, and other environmental and health impacts from the Project, including potential impacts to low-income and minority populations.
- Questions about how the Project has estimated future freight travel through the tunnels, concerns that increased freight usage beyond what is estimated could have greater impacts.
- Questions about the process moving forward and whether there will be another public hearing or comment period for the FEIS.
- Concerns that community feedback has not been adequately reflected in the final recommendations.
- Questions about the process for notifying, compensating, and/or relocating residents whose homes would be displaced.
- Concerns about the existing tunnel serving as a bat habitat and potential impacts of closing the tunnel, particularly the potential to impact pest control benefits from bats.

Since the FEIS, written feedback received by FRA and MDOT has also primarily voiced concerns similar to those comments received previously, including concerns about mitigation, previous alternatives screened out, number of tracks through the NEC, freight traffic, and disposition of the existing tunnel. An email from a community member offered a suggestion to include wireless internet access provision to the surrounding communities as a mitigation commitment. This mitigation suggestion will be considered under the purview of the community

development fund mitigation measure, described in row #2 of **Table 8,** above. FRA, Amtrak, MDOT, and the City of Baltimore are committed to continuing coordination with the public following the ROD.

FRA and MDOT also received a letter on behalf of the organization Residents Against the Tunnels (RATT) with comments on the FEIS, dated February 27, 2017. In particular, "RATT's most significant concern about the Project relates to public safety." The concerns expressed in this letter, and responses from FRA and MDOT, are included in **Table 9** below.

Table 9: Response to Comments from RATT

Summary of Comment from RATT	Project Response
RATT states concern that the Project has not adequately considered the potential for future increase in freight and resulting public safety impacts. The concern is due in part to the Project's accommodation of double-stack freight clearances, greater track capacity, and the existing trackage rights of freight operators along the NEC. The letter cites references to freight in the Project Purpose and Need chapter of the FEIS, and expresses concerns over potential environmental impacts from higher volumes of freight.	Additional clarification has been added to this ROD regarding the Project assumptions for future freight use of the Selected Alternative (See **Section IV.P**.) Substantial increases in the amount of freight using the Selected Alternative are unlikely due to factors such as the conflicts in scheduling slow-moving freight trains without disrupting high-speed passenger trains, the lack of connections to freight lines, alternative routes for freight through the City, and other factors explained in **Section IV.P.1** and **Section IV.P.3**. The primary elements of the Purpose and Need, as stated in **Section III.B** and **Section II.C**, are principally focused on passenger rail, and not specifically developed to address future freight needs. The Purpose and Need section in this ROD clarifies that the Project has been designed to not preclude freight traffic through the Tunnel for its 100+ year lifespan, including double-stack freight. Numerous other major infrastructure improvements beyond those included in the Selected Alternative would be required in order to route double-stack freight through the Selected Alternative.
RATT requests additional information on environmental impacts (including air quality and increased noise and vibration) at varying higher levels of freight train volume, including double-stack freight traffic.	Varying higher levels of freight train volume were not assessed because, although it is reasonably foreseeable that future efforts, independent of the B&P Tunnel Project, could lead to a double-stack corridor through Baltimore, substantial increases in freight traffic through the corridor are not planned or proposed. Analysis of current traffic on the NEC through Baltimore does not indicate that existing freight levels through the B&P Tunnel are to change in the near future, or that the Selected Alternative would be likely to induce additional freight traffic or significantly larger loads. (More information is included in **Section IV.P**.) While future freight levels cannot be precisely predicted, FRA has made an informed judgement based on available information that freight levels are not likely to increase substantially. Any further assessment of potential increases in freight traffic would not reflect known or foreseeable future circumstances. Such a speculative analysis would not provide useful information in the decision making process or in determining the environmental impacts of the Selected Alternative. By way of example, however, FRA has undertaken analysis to determine what level of freight traffic would result in exceeding the

Summary of Comment from RATT	Project Response
	NAAQS *de minimis* thresholds for NO_x and $PM_{2.5}$ at the Intermediate Ventilation Facility. To exceed the NAAQS *de minimis* thresholds for NO_x and $PM_{2.5}$ at the Intermediate Ventilation Facility, one would need to assume approximately thirty-four times more freight traffic than currently operates through the existing tunnel, or 68 freight trains daily. This volume could not be accommodated, as explained in **Section IV.P.5**. Because there is no specific threshold on which to base a hypothetical assessment of noise and vibration, FRA has not undertaken a similar hypothetical analysis for noise and vibration.
RATT states concerns about a potential increase in HM transported through the Selected Alternative and potential releases of HM.	Additional clarifying information about HM transport through the Selected Alternative has been added to this ROD in **Section IV.P.2** and **IV.P.6**. Construction of the new tunnel with larger tunnel bores as part of the Selected Alternative are not anticipated to change the amount of HM shipments, compared with the existing tunnel. Similarly, construction of the new tunnel would not increase the likelihood of a release of HM. Due in part to safety regulations, the likelihood of a release of such material is extremely small and, should one occur, the design of the Selected Alternative would reduce the threat to surrounding areas and their inhabitants compared with the same event occurring in the existing B&P Tunnel or in open air.
RATT states concern that the tunnel could become a target for terrorism, especially if greater amounts of HM are transported.	FRA did not analyze the environmental impacts of a potential terrorist attack on the Selected Alternative since FRA determined the potential for a terrorist attack on the NEC is a marginal risk without a reasonably close causal relationship to FRA's approval of the Selected Alternative; any analysis would be speculative and would not be useful in determining the likely environmental impacts resulting from the construction of the Selected Alternative. Furthermore, an increase in hazardous materials traveling through the corridor is not anticipated, as explained in **Section IV.P.6**.
RATT states concern about missing information, particularly regarding potential for explosion in the tunnel, potential for air quality impacts near the ventilation facilities, and analysis of safety risk and disaster planning.	By upgrading dated infrastructure to modern facilities, the Selected Alternative will be an improvement to overall safety relative to existing conditions. The benefits of a modern tunnel (such as the Selected Alternative) as concerns management of HM releases and their potential effect on communities are that the tunnel will contain an explosion or fire/smoke condition and permit direction of the heat and smoke to the point of least impact, whether that is the portals or one or more of the three ventilation facility louver systems. The tunnel also has pollutant monitoring systems that detect pollutants and signal their location. More information is included in **Section IV.P**. The American Meteorological Society/U.S. EPA Regulatory Model (AERMOD) was used to evaluate the potential 1-hour NO_2 emissions from the proposed ventilation facilities. This analysis is designed to evaluate the potential for impacts to communities immediately surrounding the ventilation facilities. The results of this analysis are

Summary of Comment from RATT	Project Response
	presented in **Section IV.H** above. More detail is available in Chapter VI of the FEIS and the accompanying technical reports. Additional information on emergency response and safety regulations for the Selected Alternative is included in **Section IV.P.2** and **IV.P.6**. The Selected Alternative will include development of an Emergency Management Plan, developed during final design, to be implemented in the event of a tunnel emergency. More information on potential for derailments in the Selected Alternative is included in **Section IV.P.6**.
Concerns about consistency between the Project and the NEC FUTURE Tier 1 FEIS.	The NEC FUTURE is a high-level programmatic document that appropriately relies on a programmatic environmental impact statement, whereas the B&P Tunnel DEIS and FEIS provided more detailed project-level analysis, including site-specific field survey and study. As a result of the different level of analysis completed for each study, small discrepancies are possible. In cases of discrepancy, the impacts assessed in the B&P Tunnel DEIS and FEIS provides more conclusive, site-specific environmental impacts assessment than NEC FUTURE.
RATT suggests need for comprehensive review of Baltimore's railway system and for improvements that review all potential needs together, rather than considering individual projects separately. RATT states concern that a project by project approach precludes other potential solutions.	FRA provides grant funding for infrastructure studies and projects as they are proposed by project sponsors that compete for grant funding through FRA's competitive solicitation process. FRA provided MDOT with grant funding for PE/NEPA for the Project and prepared the EIS for the Project based on MDOT's successful application to address the chokepoint created by the existing B&P Tunnel. As determined at the time of obligation of grant funds, the Project has independent utility and therefore FRA selected the Project to advance at project-level NEPA analysis. As required under NEPA, FRA developed a Purpose and Need statement that addresses MDOT's proposal and considered a reasonable range of alternatives that had the potential to meet that Purpose and Need. Additionally, FRA prepared the EIS in consideration of comprehensive studies of rail transportation in Baltimore including NEC FUTURE and *Baltimore's Railroad Network: Challenges and Alternatives* (FRA, 2005) and *Baltimore's Railway Network: Analysis and Recommendations* (FRA and MDOT, 2011).

VII. DECISION

FRA determines that the Preferred Alternative is the Selected Alternative for the B&P Tunnel Project. FRA finds that the Preferred Alternative, including the preferred Intermediate Ventilation Facility site, best fulfills the Purpose and Need for the Project while balancing impacts on the natural and human environment. In reaching this decision, FRA considered the physical and operational characteristics and potential environmental consequences associated with the alternatives. In reaching this decision, FRA, as lead agency, considered the EIS documents, including the analysis of the No-Build Alternative and all build alternatives, and all public and agency comments received during Project development.

A. Section 106

Section 106 of the NHPA requires that any federal agency having direct or indirect jurisdiction over a proposed federal or federally-assisted undertaking take into account the effect of the undertaking on any district, site building, structure, or other object that is listed or eligible for listing on the NRHP.

The PA in **Appendix B** documents the terms and conditions agreed upon by the signatories (FRA, Amtrak, the Maryland State Historic Preservation Officer (MHT), and Preservation Maryland), to resolve adverse effects on historic properties and concludes FRA's Section 106 process (36 C.F.R. § 800.16(t)) for the Project. Major PA stipulations are summarized in **Table 8.** The PA was executed on March 2, 2017.

B. Section 4(f)

Projects that are undertaken by an operating administration of the USDOT or that may receive federal funding and/or discretionary approvals from a USDOT operating administration must demonstrate compliance with Section 4(f) of the DOT Act of 1966. Section 4(f) protects publicly-owned parks, recreational areas, and wildlife refuges. Section 4(f) also protects historic sites of national, state, or local significance that are on public or private land. FRA published its Final Section 4(f) Evaluation with the FEIS.

The FEIS and Section 4(f) Evaluation includes FRA's evaluation of whether the Project would result in any of the following "uses" of properties protected under Section 4(f): permanent use (which encompasses permanent easements or temporary easements that exceed limits for temporary occupancy), temporary occupancy, and constructive use. Impacts were then evaluated to see if the criteria for *de minimis* impact determination were met and appropriate coordination with officials having jurisdiction over each resource was conducted.

Through the avoidance analysis included in the FEIS, FRA determined there is no feasible and prudent avoidance alternative for this Project. If there is no feasible and prudent avoidance alternative, FRA may only approve the alternative that results in the least overall harm in light of Section 4(f)'s preservation purpose. Because all alternatives use Section 4(f) properties, FRA conducted a least harm analysis to determine the alternative with the least overall harm. The least harm analysis is presented in detail in the FEIS and Final Section 4(f) Evaluation.

FRA has refined the alternatives throughout the alternatives development process to incorporate all possible planning to minimize harm to Section 4(f) properties. "All possible planning" includes all reasonable measures to minimize harm and mitigate for adverse impacts and effects. The Selected Alternative has been designed to minimize harm, including minimization measures such as shifts to the alignment, narrowed track spacing, and a relocated Intermediate Ventilation Facility. Mitigation measures will be used to further address impacts to Section 4(f) properties that could not be avoided or minimized.

FRA and MDOT worked with the Section 106 consulting parties and made engineering refinements to Alternative 3B after the publication of the DEIS in order to reduce the overall impacts to historic properties. These modifications were incorporated into the Selected Alternative. The Selected Alternative alignment would pass between the Ward Baking Company and Atlas Storage Company Warehouse properties, avoiding demolition of the Ward Baking Company building and one of the two buildings in the Atlas Storage Company Warehouse complex that would have been demolished by the DEIS Alternative 3B. The Selected Alternative alignment also impacts fewer resources contributing to historic districts. Revisions to the design reduced the impacts to historic resources from 51 demolitions in the DEIS Alternative 3B to 31 demolitions in the Selected Alternative. The alignment was shifted to reduce impacts while still avoiding demolition of other key historic resources near the south portal, such as the Fire Department Engine Company No. 36 and American Ice Company buildings.

The Selected Alternative would have greater Section 4(f) impacts compared to Alternative 3A, which would require fewer demolitions and fewer overall Section 4(f) resources used. FRA has determined, in consultation with the public and Consulting Parties, that Alternative 3B has less severe impacts to Section 4(f) resources

compared to Alternative 3C because it uses fewer Section 4(f) properties and avoids demolishing two important individually eligible historic properties, the Ward Baking Company and Fire Engine Co. 36 buildings. Both of these would be demolished under Alternative 3C, and were recommended as high priority for preservation by the Project Consulting Parties and MHT. The Selected Alternative would impact more historic rowhomes contributing to the Greater Rosemont, Midtown-Edmonson, and Edmonson Avenue Historic Districts; however, many of these have relatively less historic integrity due to their poor physical condition and thus may have less historic significance than individually eligible buildings.

The Selected Alternative would meet Purpose and Need to a much greater degree than Alternative 3A because it would improve the existing curve (Curve 381) along the NEC where the West Baltimore MARC Station is currently located, thus eliminating an impediment to existing and projected operations along the NEC. The Selected Alternative would allow for higher train speeds and greater travel time savings along the corridor compared to Alternative 3A, and thus would better meet the stated Purpose and Need regarding reducing travel time through the B&P Tunnel along the NEC. The Selected Alternative would also allow for accessible high-level platforms at the West Baltimore MARC Station, thus better accommodating existing and projected travel demand for commuter passenger service and eliminating impediments to operations along the NEC. Improvements to Curve 381 would be precluded for the lifespan of the new tunnel under Alternative 3A, preventing future speed improvements and ADA accessible MARC platforms in the current station location.

After balancing the factors included in a least overall harm analysis, particularly Alternative 3B's relative ability to meet the Purpose and Need compared to Alternative 3A, Alternative 3B has the least overall harm in light of the Section 4(f) statute's preservation purpose, and is thus the Selected Alternative. Though Alternative 3B requires greater use of Section 4(f) resources compared to Alternative 3A, the benefits of meeting the Purpose and Need to a greater degree outweighs the remaining harm, after mitigation, to Section 4(f) properties.

Substantial mitigation measures included under the Selected Alternative, developed in consultation with Project Consulting Parties (including MHT) and described in the PA (**Appendix B**), will mitigate the impacts to Section 4(f) resources resulting from the Selected Alternative.

Information on the remaining use of Section 4(f) properties is summarized in **Section IV.D**.

As a result of the evaluation, FRA finds that there is no feasible and prudent alternative to the use of nine historic sites: the Baltimore and Ohio Belt Line Railroad, Baltimore and Ohio Belt Line Bridge over Jones Falls Valley, Baltimore and Potomac Railroad, Midtown Edmondson Historic District, Bridge 2410 / Lafayette Avenue over Amtrak, Greater Rosemont Historic District, Atlas Safe Deposit and Storage Company Warehouse, the Edmonson Avenue Historic District, and the Reservoir Hill Historic District. **Section IV.D** describes the impacts to each Section 4(f) property.

The FEIS and Section 4(f) Evaluation also includes FRA's final determination that *de minimis* impacts would occur to the Fire Department Engine Company No. 36, Ward Baking Company, and Union Railroad historic properties under the Selected Alternative. MHT concurred with FRA's October, 2016 determination of no adverse effects to certain Section 4(f) properties. In this correspondence, FRA notified MHT of its intent to make a determination of *de minimis* impacts resulting from the Selected Alternative. In a letter dated January 9, 2017, the U.S. Department of the Interior concurred with the findings of the Final Section 4(f) Evaluation. This correspondence is included in **Appendix D**.

C. Environmental Justice Finding

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, signed by the President on February 11, 1994, directs federal agencies to take the appropriate and necessary steps to identify and address disproportionately high and adverse effects of federal projects on the health or environment of minority and low-income populations to the greatest extent practicable

and permitted by law. The B&P Tunnel EIS incorporated the guidance provided in the *Environmental Justice Policy Guidance for FTA Recipients, FTA Circular 4703.1* (FTA, 2012). The FTA EJ Circular was published in 2012 to provide potential recipients of FTA financial assistance with guidance in order to incorporate EJ principles into their plans, projects, and activities.

FRA has determined that the Selected Alternative would have disproportionately high and adverse effects to EJ populations as a result of property acquisition and impacts to housing, land use/zoning, community facilities, visual quality, and noise. Impacts to minority and low-income populations from the Selected Alternative are detailed in **Section IV.A.8** and in the FEIS. The existing B&P Tunnel, as well as the NEC alignment between the West Baltimore MARC Station and Baltimore Penn Station, are currently located in predominantly low-income and/or minority population areas.

Members of the public have expressed concerns that minority and low-income neighborhoods would be disproportionately impacted by the location of alternatives evaluated in the EIS, including the Selected Alternative. However, FRA identified no reasonable alternatives that would not travel through predominantly minority and low-income neighborhoods. The primary measure to avoid impacts to neighborhoods is to construct the rail alignment in a tunnel, which substantially eliminates surface impacts for much of the alignment. Project documentation in the *Preliminary Alternatives Screening Report*, *Alternatives Report*, the DEIS, and the FEIS reflect this conclusion. The Selected Alternative alignment and other alternatives analyzed were not designed specifically to pass through or avoid any particular neighborhoods or communities. Rather, the alignments were developed based on the geometry required to achieve the operational goals outlined in the Purpose and Need while minimizing overall environmental impacts to the extent possible.

FRA continually screened and refined the alternatives throughout the alternatives development process to avoid and minimize impacts to EJ communities. Furthermore, the Selected Alternative will improve accessibility and reliability at the West Baltimore MARC Station, and will include more modern safety features relative to the existing B&P Tunnel. Furthermore, FRA and MDOT have conducted a thorough EJ public and agency outreach program throughout the EIS process. This included meetings with local community associations representing EJ communities such as the Alliance of Rosemont Community Organizations, the Western District Community Council, the Reservoir Hill Community Council, Midtown-Edmondson Community Association, and the No Boundaries Coalition. This outreach will continue through the design and construction phases.

FRA is committed to measures that will minimize and mitigate impacts to EJ populations resulting from the Project. The Selected Alternative includes an extensive set of mitigation measures detailed in **Section V** of this ROD, with a total estimated Project commitment of $50 million for mitigation. These mitigation measures are designed specifically for the neighborhoods impacted by the Project, and particularly the minority and low-income populations residing within these neighborhoods. Due to the permanent nature of the Project impacts, such as building demolitions and right-of-way acquisition in EJ communities, adverse effects to EJ populations will remain after mitigation. However, the proposed mitigation measures have been developed to address these impacts to EJ communities as completely as possible and enhance the surrounding environment to offset Project impacts. Furthermore, investments in passenger rail infrastructure on the NEC will contribute to the overall economic success and community revitalization of Baltimore City, including EJ populations, by encouraging efficient regional transportation connectivity. Fast, reliable rail service is also a key factor in promoting TOD.

D. Permits and Approvals

Beyond the documentation required for NEPA, the Project implementers may need to secure additional permits and approvals prior to the construction of the Project. Typically, these permits and approvals would be obtained as needed during the final design phase once construction funding is secured. **Table 10** below summarizes the potential approvals and permits that may be needed.

Table 10: Permits and Approvals Potentially Required

Project Impacts/Compliance	Authorizing or Coordinating Agency	Regulatory Requirement/Permit Application
Federal Authorizations/Compliance		
Rare, Threatened, and Endangered Species	U.S. Fish and Wildlife Service (USFWS), Maryland Department of Natural Resources (MDNR)	Endangered Species Act update, Section 7 Compliance: Environmental Review
Noise & Vibration	Federal Railroad Administration (FRA)	Noise and vibration assessment / control / mitigation
State Authorizations/Compliance		
Development within 100-Year Floodplain, Wetlands, and/or Waterways	Maryland Department of the Environment (MDE)	Nontidal Wetlands and Waterways Permit and Individual Water Quality Certification: Joint Federal/State Application for the Alteration of any Floodplain Waterway, Tidal or Nontidal Wetland in Maryland (as necessary)
Stormwater Management and Erosion and Sediment Control	MDE Sediment, Stormwater & Dam Safety Program	Stormwater Management Approval: Waterway Construction Permit; Erosion and Sediment Control Plan Approval
Stormwater Management Associated with Construction Activity	MDE Sediment, Stormwater & Dam Safety Program	National Pollutant Discharge Elimination System (NPDES) NOI for general permit coverage
Dewatering and Groundwater Withdrawal for Dewatering Operations	MDE	MDE Water Appropriations Permit
Operation/Equipment that Discharges Emissions	MDE, Air Permits Program	Air Quality Permit to Construct
Noise & Vibration	MDE	Compliance to MDE 26.02.03 Control of Noise Pollution or receive variance during construction phase
Local Authorizations/Compliance		
Development within 100-Year Floodplain	Baltimore City Department of Planning	Submission of Development Plans with elevation of project
Dewatering and Groundwater Withdrawal for Dewatering Operations	Baltimore City Department of Planning	Well Construction Permit
Clearing Forest	Baltimore City Department of Planning	Forest Conservation Act Approval: Forest Stand Delineation, Forest Conservation Plan

Project Impacts/Compliance	Authorizing or Coordinating Agency	Regulatory Requirement/Permit Application
Removal of Street Trees	Baltimore City Department of Recreation and Parks, Forestry Division	Baltimore City Street Tree Removal and Replacement Approval/Permit
Construction Projects	Baltimore City Department of Housing and Community Development (DHCD)	Building Permit. Upload construction plans to E-plans
Construction within Right of Way	Baltimore City Department of General Services (DGS)	Developers Agreement
Impacts to Surrounding Transportation Network & Communities	Baltimore City Department of Transportation (DOT)	Traffic Impact Study (TIS)
New Facilities	Baltimore City Department of General Services	Construction Permit
Noise & Vibration	Baltimore City Department of Planning	Construction sites exempt to Health Code of Baltimore City (9-103.b Noise Regulation)
Railroad Access	Amtrak, Norfolk Southern, MARC	Railroad Access Permit, required in conjunction with railroad agreements

VIII. CONCLUSION

FRA has reached a decision for the B&P Tunnel Project that most closely aligns with FRA's statutory mission and responsibilities, giving consideration to economic, environmental, technical, and other factors based on the information contained in the DEIS and FEIS documents. FRA selects the Preferred Alternative (Alternative 3B), including the preferred Intermediate Ventilation Facility Site at 900-940 West North Avenue, for Project implementation. FRA has selected this alternative because it provides the best overall balance in consideration of both the Purpose and Need and the potential environmental impacts of the Project, including the offsetting benefits of the Project and accompanying mitigation measures. Additionally, investment in critical NEC infrastructure through Baltimore City to meet the Purpose and Need of the Project will promote the long-term economic success of the City and surrounding region.

Paul Nissenbaum
Associate Administrator
Federal Railroad Administration

March 24, 2017
Date of Approval

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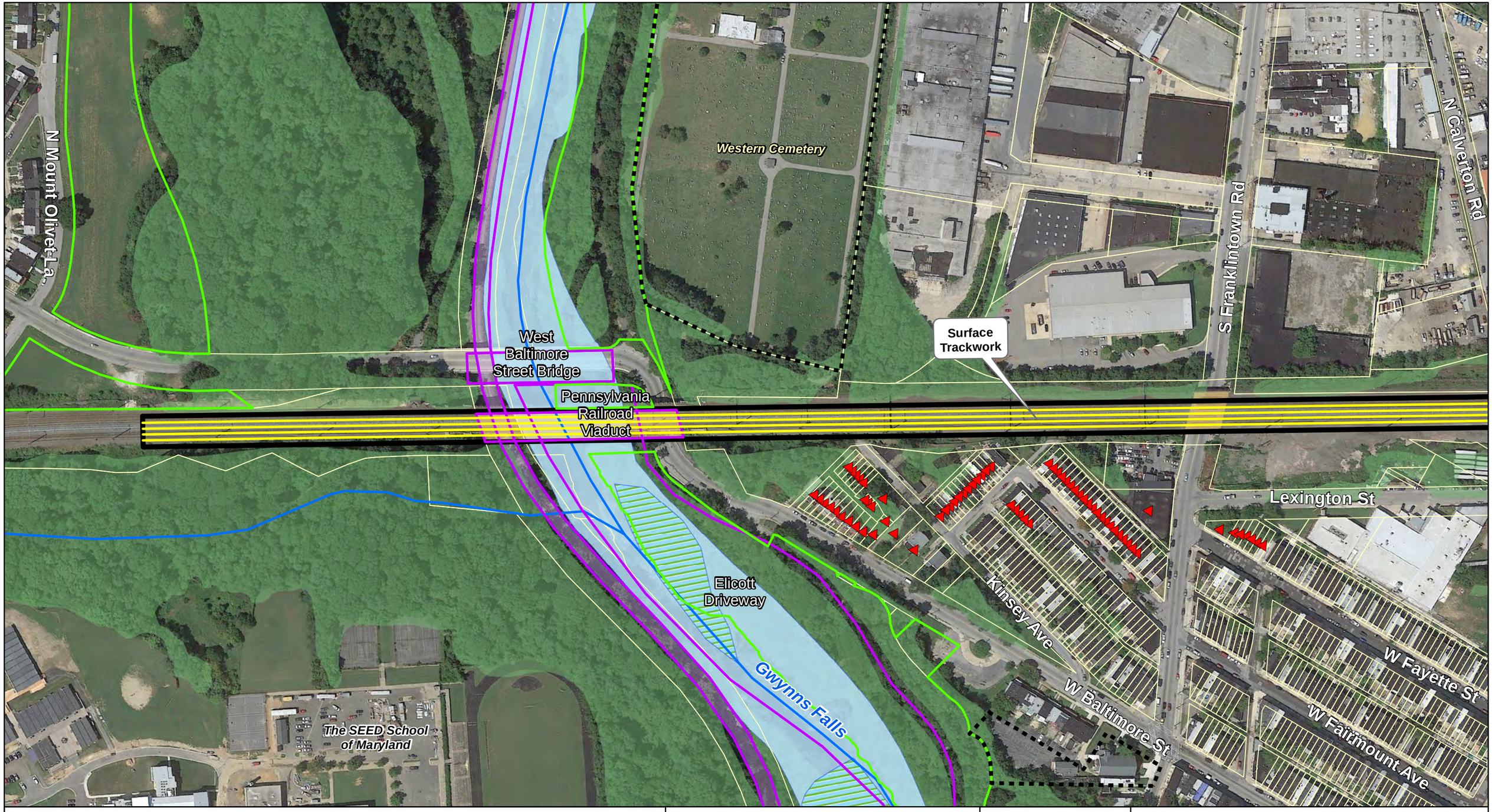
Appendix A

B&P TUNNEL PROJECT

Environmental Resource Mapping

U.S. Department of Transportation
Federal Railroad Administration

Maryland Department
of Transportation



- Selected Alternative
- Limits of Surface Disturbance
- Bored Tunnel
- Ventilation Facility
- Proposed Noise Barriers
- Parcel Boundaries
- Individually Registered or Eligible Historic Resource
- Contributing to Historic District
- Historic Districts
- Potential Ground-Borne Noise Impact Site for Further Assessment
- Residential Building Displacement
- Community Facility Displacement
- Business Displacement
- Moderate Noise Impact *
- Severe Noise Impact *

* Prior to Mitigation

- NWI Wetlands
- 100-Year Floodplain
- Parks
- Streams
- Tree Cover
- Community Facilities

B&P Tunnel Project

Selected Alternative
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NORTH

1 inch = 200 feet

0 100 200 400 Feet

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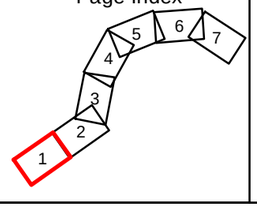

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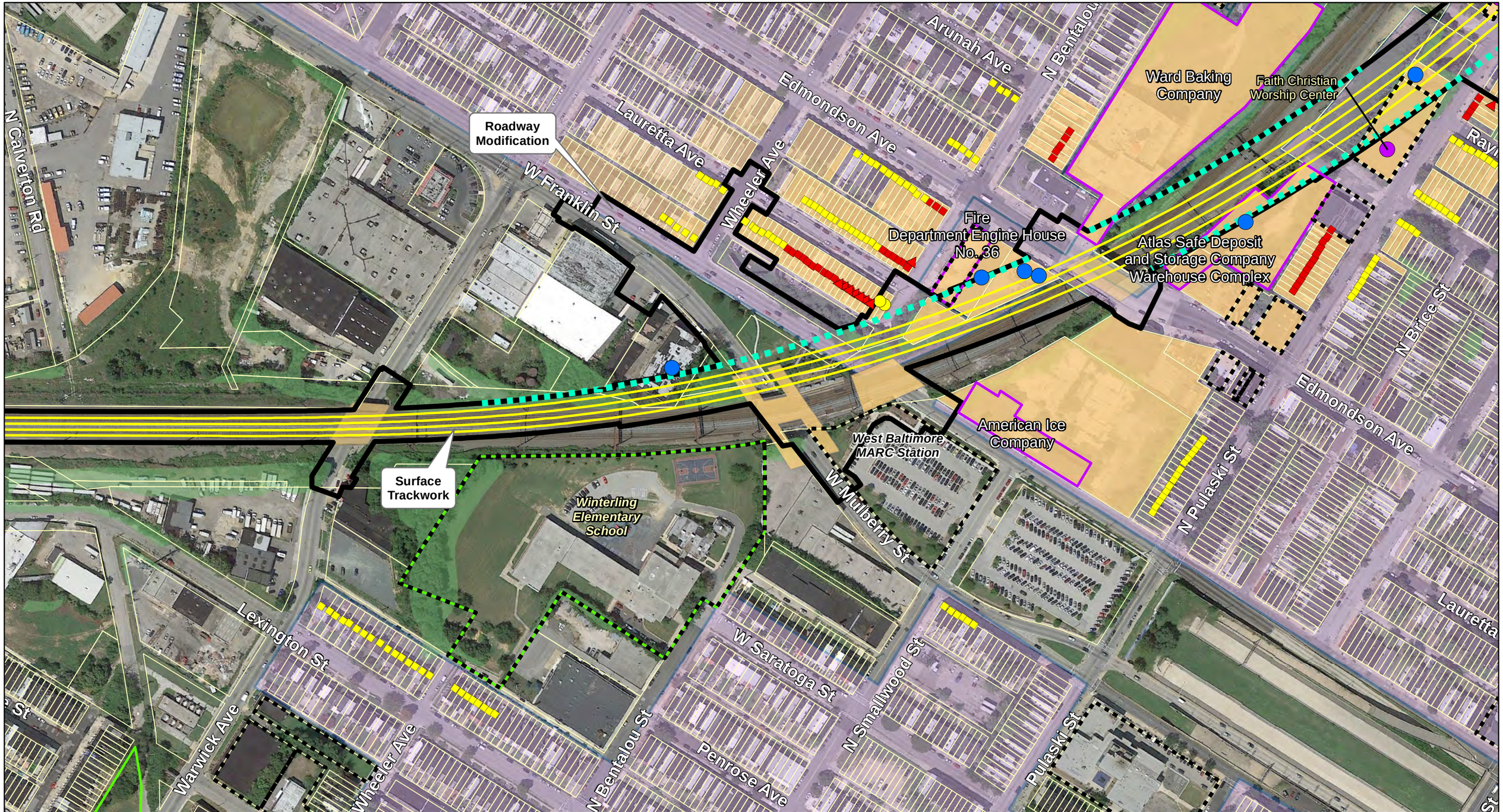

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Selected Alternative
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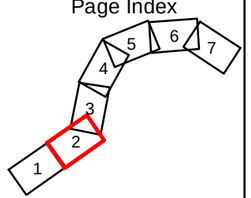

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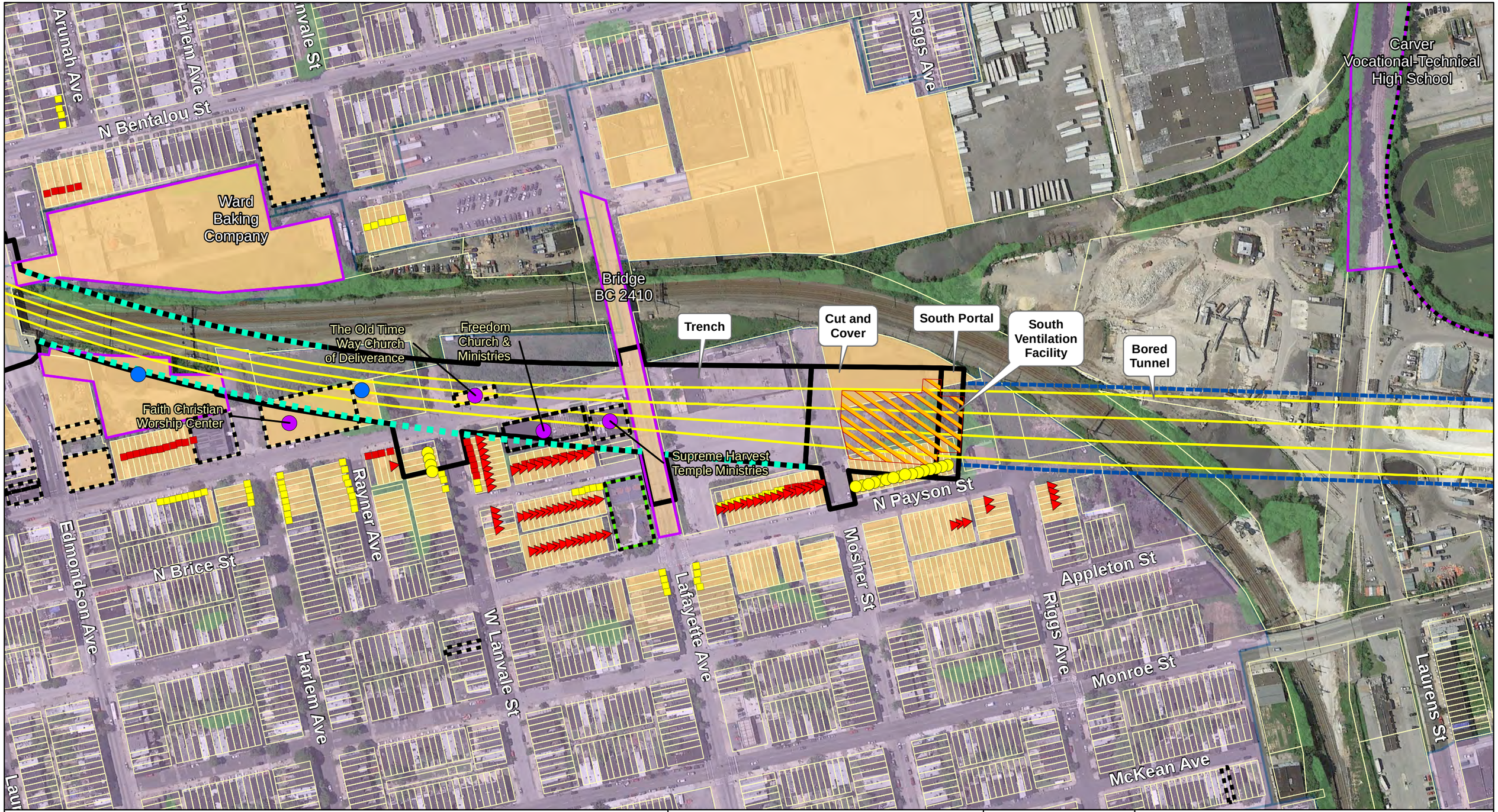

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0 100 200 400 Feet

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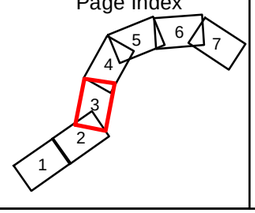


B&P TUNNEL PROJECT

U.S. Department of Transportation
Federal Railroad Administration

Maryland Department of Transportation

Carver
Vocational-Technical
High School

Bored Tunnel

N Pulaski St
Baker St
N Payson St
Appleton St
N Monroe St
Westwood Ave
North Ave
Bruce St
McKean Ave
Kavanaugh St
Lorman St
Laurens St
N Fulton Ave
N Mount St
N Gilmor St
Presbury St
Carey St
N Stockton St

Selected Alternative
Limits of Surface Disturbance
Bored Tunnel
Ventilation Facility
Proposed Noise Barriers
Parcel Boundaries

Individually Registered or Eligible Historic Resource
Contributing to Historic District
Historic Districts
Potential Ground-Borne Noise Impact Site for Further Assessment

Residential Building Displacement
Community Facility Displacement
Business Displacement
Moderate Noise Impact *
Severe Noise Impact *
* Prior to Mitigation

NWI Wetlands
100-Year Floodplain
Parks
Streams
Tree Cover
Community Facilities

NORTH

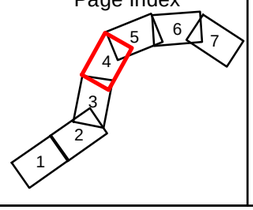
B&P Tunnel Project

Selected Alternative
Page 4 of 7

1 inch = 200 feet

0 100 200 400 Feet

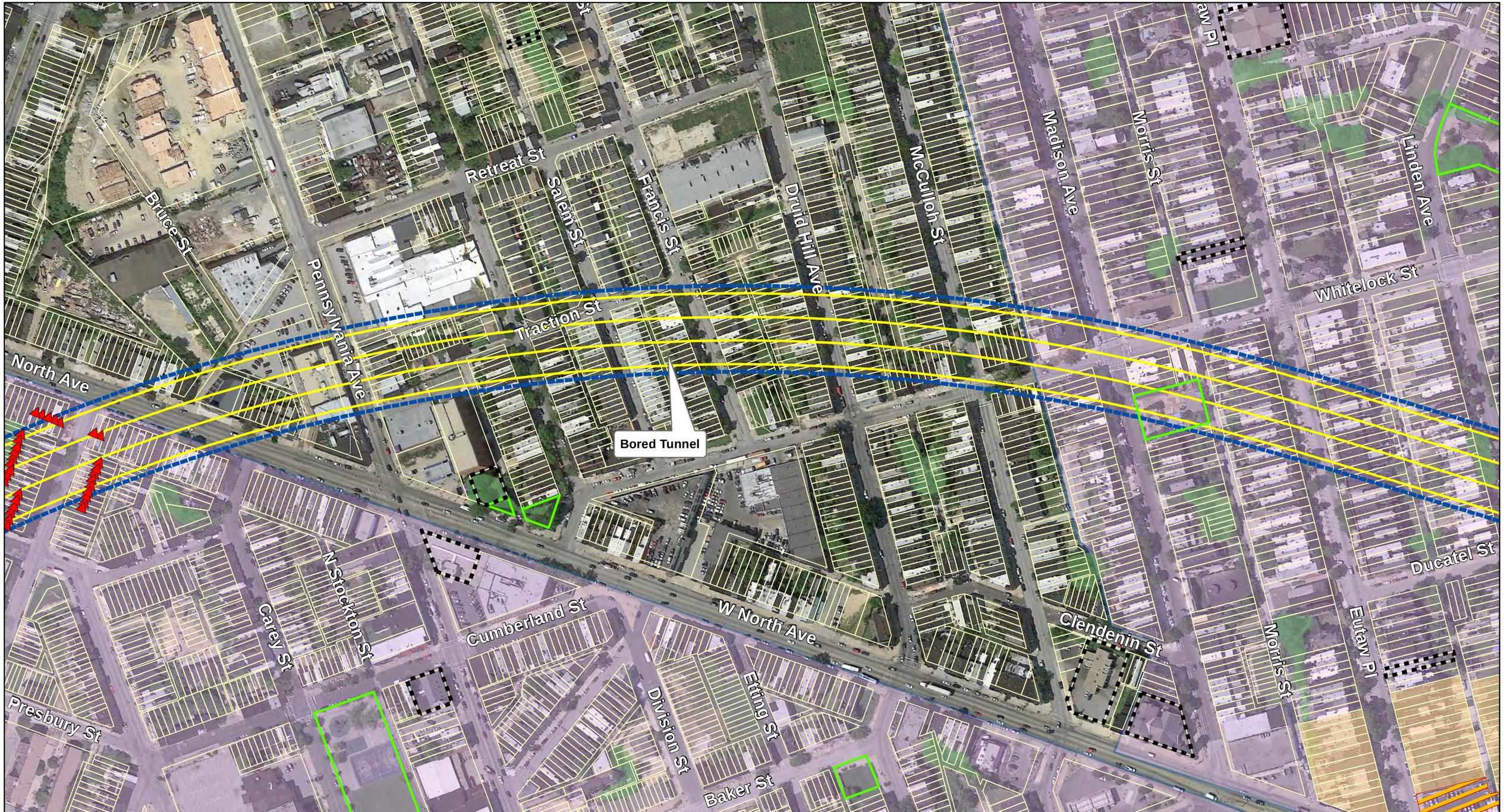
Page Index



B&P TUNNEL PROJECT

U.S. Department of Transportation
Federal Railroad Administration

Maryland Department of Transportation



- Selected Alternative
- Limits of Surface Disturbance
- Bored Tunnel
- Ventilation Facility
- Proposed Noise Barriers
- Parcel Boundaries
- Individually Registered or Eligible Historic Resource
- Contributing to Historic District
- Historic Districts
- Potential Ground-Borne Noise Impact Site for Further Assessment
- Residential Building Displacement
- Community Facility Displacement
- Business Displacement
- Moderate Noise Impact *
- Severe Noise Impact *

* Prior to Mitigation

- NWI Wetlands
- 100-Year Floodplain
- Parks
- Streams
- Tree Cover
- Community Facilities

B&P Tunnel Project

Selected Alternative
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NORTH

1 inch = 200 feet

0 100 200 400 Feet

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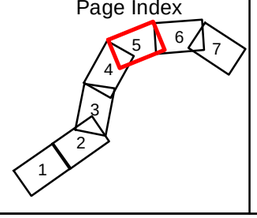

B&P TUNNEL PROJECT

U.S. Department of Transportation
Federal Railroad Administration

Maryland Department of Transportation

Whitelock St
Newington Ave
Reservoir St
W North Ave
North Ave
Mt Royal Terr
Falls Rd
Brookfield Ave
Ducatel St
Eutaw Pl
Park Ave
Lennox St
83
Bored Tunnel
Intermediate Ventilation Facility 900-940 W. North Ave
John Eager Howard Elementary School

- Selected Alternative
- Limits of Surface Disturbance
- Bored Tunnel
- Ventilation Facility
- Proposed Noise Barriers
- Parcel Boundaries
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- Severe Noise Impact *

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- NWI Wetlands
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- Parks
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- Tree Cover
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B&P Tunnel Project

Selected Alternative
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1 inch = 200 feet

NORTH

0 100 200 400 Feet

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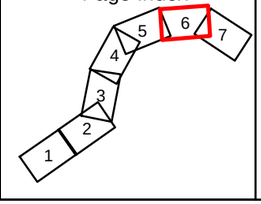
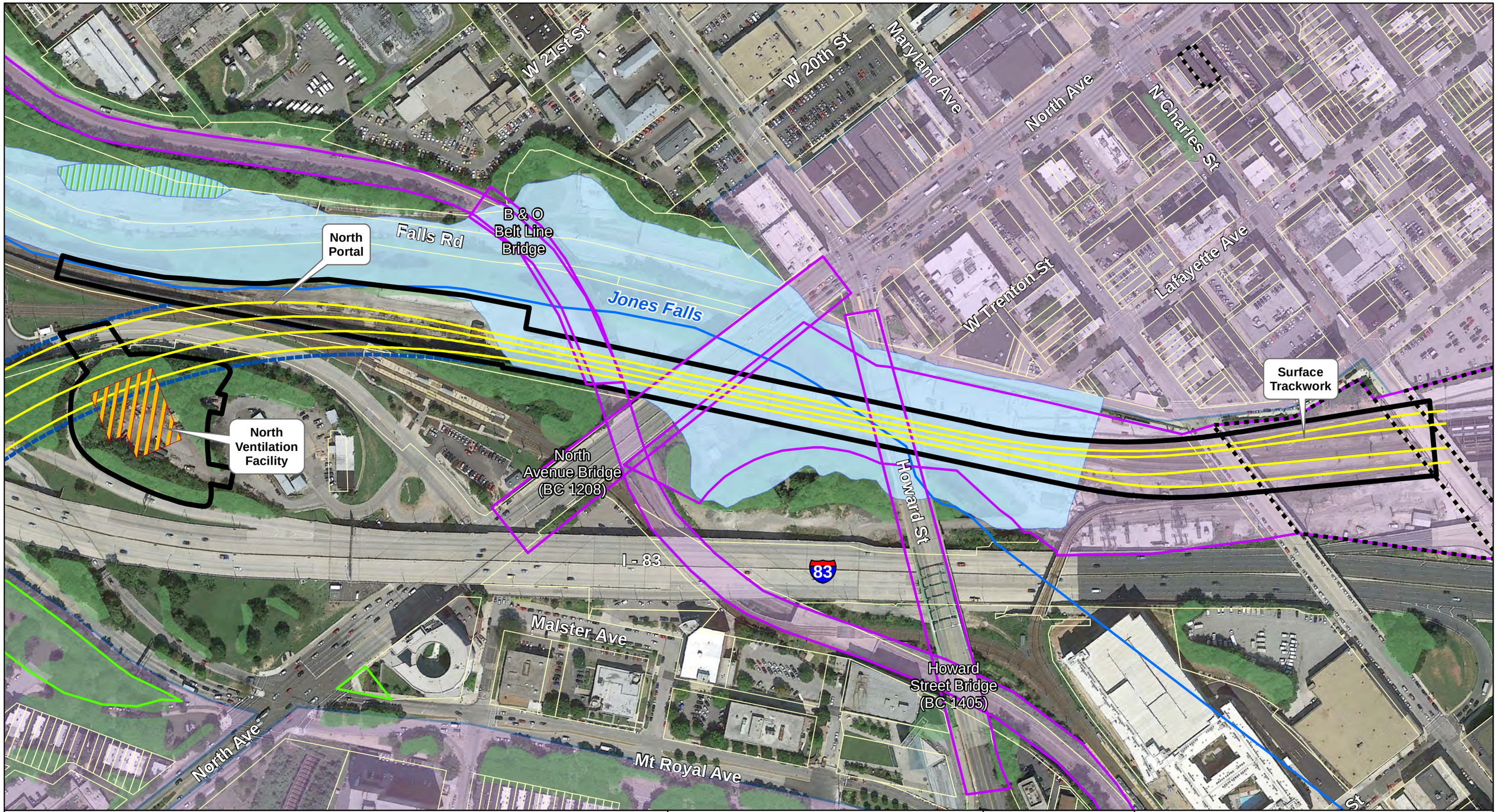


B&P TUNNEL PROJECT

U.S. Department of Transportation
Federal Railroad Administration

Maryland Department of Transportation



- Selected Alternative
- Limits of Surface Disturbance
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- Business Displacement
- Moderate Noise Impact *
- Severe Noise Impact *

* Prior to Mitigation

- NWI Wetlands
- 100-Year Floodplain
- Parks
- Streams
- Tree Cover
- Community Facilities

B&P Tunnel Project

Selected Alternative
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1 inch = 200 feet

NORTH

0 100 200 400 Feet

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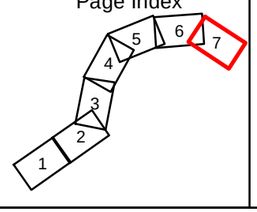

B&P TUNNEL PROJECT

U.S. Department of Transportation
Federal Railroad Administration

Maryland Department of Transportation

Appendix B

B&P TUNNEL PROJECT

Final Section 106 Programmatic Agreement

U.S. Department of Transportation
Federal Railroad Administration

Maryland Department
of Transportation

PROJECT PROGRAMMATIC AGREEMENT

Among the
FEDERAL RAILROAD ADMINISTRATION
MARYLAND STATE HISTORIC PRESERVATION OFFICER
NATIONAL RAILROAD PASSENGER CORPORATION
And
PRESERVATION MARYLAND

Regarding the
BALTIMORE & POTOMAC TUNNEL PROJECT
BALTIMORE CITY, MARYLAND

WHEREAS, the existing 1.4-mile-long Baltimore & Potomac (B&P) Railroad Tunnel (B&P Tunnel), located along the National Railroad Passenger Corporation's (Amtrak) Northeast Corridor (NEC) in Baltimore City, was constructed in 1873 and is nearing the end of its useful life, with existing structural and operational deficiencies that cannot accommodate projected regional high-speed travel requirements on the NEC; and

WHEREAS, the Federal Railroad Administration (FRA) has provided grant funding under the Fiscal Year 2009 High-Speed Intercity Passenger Rail Program to the Maryland Department of Transportation (MDOT) to carry out preliminary engineering and environmental analyses in compliance with the National Environmental Policy Act (42 U.S.C. § 4321 et seq.) (NEPA) for alternatives to replace the existing tunnel (PE/NEPA); and

WHEREAS, FRA is preparing an Environmental Impact Statement (EIS) pursuant to NEPA and has coordinated the NEPA process with consultation pursuant to Section 106 of the National Historic Preservation Act of 1966 (54 U.S.C. § 306108) (NHPA), as amended, and its implementing regulations at 36 CFR § 800 (hereinafter collectively referred to as Section 106); and

WHEREAS, the Preferred Alternative identified in the Final EIS consists of replacing the existing B&P Tunnel by constructing a new 1.9-mile-long, four-bore tunnel along a new four-track alignment within Baltimore City, together with three ventilation facilities (one each at the north and south tunnel portals and one at an intermediate location along West North Avenue) and associated bridges, cuts, retaining walls, water management systems, track work, and electrified traction infrastructure (hereinafter referred to as the Project) (**Attachment 1**); and

WHEREAS, determining the final disposition of the existing B&P Tunnel and associated track alignment is not a part of the Project and has not been addressed; and

WHEREAS, Amtrak, owner and operator of the NEC and the existing B&P Tunnel, has acted as the Project designer responsible for carrying out the preliminary engineering in support of the NEPA documentation process; and

WHEREAS, FRA has determined that, should FRA provide funding for the Project, it would be an undertaking pursuant to Section 106, and FRA would be responsible for compliance with Section 106; and

WHEREAS, should FRA provide funding for the Project, FRA intends to use this Project Programmatic Agreement (PA) to satisfy its Section 106 responsibilities; and

WHEREAS, FRA, in consultation with the Maryland State Historic Preservation Officer (MD SHPO), has defined the Project's area of potential effects (APE) for historic architecture (**Attachments 2 and 3**) and conducted technical studies for both historic architecture and archeology pursuant to Section 106 (**Attachment 4**); and

WHEREAS, FRA invited parties to consult regarding the effects of the Project on historic properties and some accepted, and FRA has consulted with 1) Delaware Tribe of Indians; 2) Shawnee Tribe; 3) Baltimore City Commission for Historical and Architectural Preservation (CHAP); 4) Baltimore City Department of Transportation; 5) Baltimore City Planning Department; 6) Baltimore Heritage; 7) Baltimore Heritage Area Association; 8) Historic Mount Royal Terrace Association; 9) Maryland Commission on Indian Affairs (MCIA); 10) Maryland Department of Transportation; 11) Maryland Transit Administration; 12) Midtown Edmondson Improvement Association; 13) Mount Royal Improvement Association; and 14) Preservation Maryland and has afforded the public-at-large an opportunity to comment through the concurrent NEPA public involvement process; and

WHEREAS, through consultation, FRA has identified the following seventeen (17) architectural historic properties in the APE that are listed in or eligible for listing in the National Register of Historic Places (NRHP) (see **Attachments 2 and 3**):

1. Baltimore and Ohio (B&O) Railroad, Baltimore Belt Line (B-5287)
2. B&O Railroad, Baltimore Belt Line Bridge over Jones Falls Valley (B-5288)
3. B&P Railroad (Philadelphia, Baltimore and Washington Railroad) (B-5164)
4. Union Railroad (B-5163)
5. Howard Street Bridge (BC1405) (B-4529)
6. North Avenue Bridge (BC1208) (B-4521)
7. Reservoir Hill Historic District (B-1379)
8. Bolton Hill Historic District (B-64)
9. Midtown Edmondson Historic District (NRHP Nomination Pending)
10. Bridge BC 2410 (Lafayette Avenue over Amtrak) (B-4553)
11. Atlas Safe Deposit and Storage Company Warehouse Complex (B-5188-2)
12. American Ice Company (B-1040)
13. Greater Rosemont Historic District (B-5112)
14. Edmondson Avenue Historic District (B-5187)
15. Ward Baking Company (B-5112-2)
16. Fire Department Engine House No. 36 (B-5112-4)
17. Pennsylvania Railroad Viaduct (B-5064); and

WHEREAS, through consultation, FRA has determined that the Project, if constructed,

will have an adverse effect on the following nine (9) historic properties:

1. B&O Railroad, Baltimore Belt Line
2. B&O Railroad, Baltimore Belt Line Bridge over Jones Falls Valley
3. B&P Railroad (Philadelphia, Baltimore and Washington Railroad)
4. Reservoir Hill Historic District
5. Midtown Edmondson Historic District
6. Bridge BC 2410 (Lafayette Avenue over Amtrak)
7. Atlas Safe Deposit and Storage Company Warehouse Complex
8. Greater Rosemont Historic District
9. Edmondson Avenue Historic District; and

WHEREAS, through consultation, FRA has concluded that the Project is located in an area with potential for both pre- and post-contact archeological resources but that Project designs cannot be sufficiently advanced at this time, and the identification and effects on archeological resources cannot be fully determined prior to approval of the Project; and

WHEREAS, through consultation, FRA has elected to complete the final identification, evaluation, and effects assessment on archeological resources in phases, pursuant to 36 CFR § 800.4(b)(2) and 800.5(a)(3), and in accordance with the ongoing consultation process specified in this PA pursuant to 36 CFR § 800.14(b); and

WHEREAS, FRA has invited Amtrak, as the Project designer, owner, and operator of the NEC, to participate in this PA as an invited signatory with responsibilities under this PA, and Amtrak has accepted; and

WHEREAS, FRA has invited Preservation Maryland, a private non-profit organization with a demonstrated focus on, and expertise in, historic preservation and grants administration, to participate in this PA as an invited signatory with responsibilities under this PA, and Preservation Maryland has accepted; and

WHEREAS, FRA has invited all other consulting parties to be concurring parties under this PA, and consulting parties may accept the invitation to become a concurring party by signing this PA within two weeks of the date the PA is distributed to consulting parties for signature; and

WHEREAS, the MD SHPO agrees that fulfillment of the terms of this MOA will satisfy the responsibilities of any Maryland state agency under the requirements of the Maryland Historical Trust Act of 1985, as amended, State Finance and Procurement Article §§ 5A-325 and 5A-326 of the Annotated Code of Maryland, for any components of the Project that require licensing, permitting, and/or funding actions from Maryland state agencies; and

WHEREAS, in accordance with 36 CFR § 800.6(a)(1), FRA has notified the Advisory Council on Historic Preservation (ACHP) of its adverse effect determination and intention to enter into a PA with specified documentation by letter dated April 6, 2016, and the ACHP, by letter dated June 7, 2016, declined to participate in the consultation pursuant to 36 CFR § 800.6(a)(1)(iii); and

NOW, THEREFORE, FRA, the MD SHPO, Amtrak, and Preservation Maryland (each a signatory and together signatories) agree the Project will be implemented in accordance with the following stipulations in order to take into account the effect of the Project on historic properties.

STIPULATIONS

I. APPLICABILITY

A. With the exception of the provisions regarding the identification, assessment, and adoption of treatment measures in Stipulations V, VI, VII, VIII, IX, and X, this PA applies to FRA's undertaking and only binds FRA if FRA provides financial assistance for activities necessary to advance the Project toward and/or through construction.

B. Notwithstanding Stipulation I.A., this PA applies to all of Amtrak's activities necessary to advance the Project toward and/or through construction, including, but not limited to, further design, acquisition of property for the Project, demolition of acquired properties, and construction that are funded with any amount of financial assistance from FRA or non-federal funds. Nothing herein will be interpreted as agreement by Amtrak that Section 106 applies to other Amtrak projects with independent utility that use exclusively non-federal funds. This PA does not apply to actions or activities having independent utility that Amtrak may carry out, including the normal maintenance, upkeep, and continued safe operation of the NEC.

C. This PA could apply should another federal agency have an undertaking as part of the Project; that agency may adopt this PA and agree to comply with its terms to fulfill its Section 106 responsibilities, as provided for in Stipulation XIV.

II. TIMING

Activities necessary to advance the Project toward and/or through construction may be phased or implemented incrementally, as appropriate, relative to the schedule(s) and funding availability for further design and construction.

III. ROLES AND RESPONSIBILITIES

A. FRA, as a signatory and the lead federal agency for the Project, has authority to execute, amend, and/or terminate this PA. FRA will ensure that the identification, assessment, and adoption of treatment measures are carried out in accordance with the procedures established in Stipulations V, VI, VII, VIII, IX, and X, regardless of whether activities necessary to advance the Project toward and/or through construction are funded with financial assistance from FRA or non-federal funds. If FRA provides financial assistance for the Project, in addition to ensuring that the identification, assessment, and adoption of treatment measures are carried out in accordance with the procedures established in Stipulations V, VI, VII, VIII, IX, and X, FRA will also ensure that all other stipulations and procedures in this PA are carried out, as appropriate, in accordance with the terms prescribed in this PA. If FRA provides financial assistance for activities necessary to advance the Project toward and/or through construction, FRA will continue to consult with all parties identified in the initial Section 106 consultation process resulting in the creation of this PA, and, as needed, FRA will identify and invite additional

consulting parties to participate in the implementation of this PA. FRA will have sole authority to conduct government-to-government consultation with federally recognized Native American tribes, as needed.

B. The MD SHPO, as a signatory with responsibility for regulatory review and compliance, has authority to execute, amend, and/or terminate this PA and is also responsible for providing formal review and comment for actions requiring the same as part of carrying out this PA.

C. Amtrak, as an invited signatory, has the same rights with regard to seeking amendment and/or termination of this PA as other signatories and will ensure that specified stipulations and procedures, for which it has assumed responsibility, are carried out in accordance with the terms prescribed in this PA.

D. Preservation Maryland, as an invited signatory, has the same rights with regard to seeking amendment and/or termination of this PA as other signatories and ensures that specified stipulations and procedures, for which it has assumed responsibility, are carried out in accordance with the terms prescribed in this PA.

E. Consulting parties include certain additional individuals or organizations with a demonstrated interest in the Project who have already participated in, or who may later join in as consulting parties in the Section 106 process due to the nature of their legal or economic relation to the Project or affected properties, or their concern with the Project's effects on historic properties. Consulting parties, who may also have signed this PA as a concurring party, retain their rights as consulting parties to participate in on-going consultation prescribed by this PA, and attain no additional rights relative to this PA.

F. Concurring parties are consulting parties who have been invited to concur in this PA. Concurring parties are able to review and comment on draft documentation prepared pursuant to stipulations herein.

IV. PROFESSIONAL QUALIFICATIONS AND STANDARDS

A. Amtrak will ensure that all work carried out pursuant to this PA will be done by or under the direct supervision of a qualified professional in the disciplines of Archeology, Architectural History and/or Historic Architecture who meets the relevant standards outlined in the Secretary of the Interior's *Professional Qualifications Standards for Archeology and Historic Preservation* (36 CFR § 61) (http://www.nps.gov/history/local-law/arch_stnds_9.htm).

B. Implementation of the stipulations pursuant to this PA will utilize, as appropriate, the following regulations, policies, standards, and guidelines, or any subsequent replacements of or revisions to same:

- Section 106, NHPA, as amended, and its implementing regulations (36 CFR § 800)
- *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic*

Buildings (National Park Service 1995)

- *Historic American Buildings Survey Guide to Field Documentation* (National Park Service, May 16, 2011)
- *Historic American Buildings Survey Guidelines for Historical Reports* (National Park Service 2007)
- *Heritage Documentation Programs, HABS/HAER/HALS Photography Guidelines* (National Park Service, November 2011, updated June 2015)
- *Standards and Guidelines for Architectural and Historical Investigations in Maryland* (Maryland Historical Trust, 2000)
- *Guidelines for Compliance-Generated Determinations of Eligibility (DOEs)* (Maryland Historical Trust, 2002)
- *Standards for Submission of Digital Images to the Maryland Inventory of Historic Properties* (Maryland Historical Trust, effective January 2008, revised January 2015)
- *Archeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines* (48 FR 44716)
- *Section 106 Archaeology Guidance* (ACHP, 2009)
- *Standards and Guidelines for Archeological Investigations in Maryland* (Maryland Historical Trust, 1994)
- *Collections and Conservation Standards, Technical Update No. 1 of the Standards and Guidelines for Archeological Investigations in Maryland* (Maryland Historical Trust, Revised 2005)
- Curation of Federally-Owned and Administered Archeological Collections (36 CFR § 79)
- Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. § 3001 et seq. and its implementing regulations at 43 CFR § 10, as amended)
- Maryland Burial Law (Title 10 Subtitle 4 §§ 10-401 through 10-404 of the Annotated Code of Maryland)
- *Policy Statement Regarding Treatment of Burial Sites, Human Remains and Funerary Objects* (ACHP, February 23, 2007)

V. TREATMENT MEASURES FOR ARCHITECTURAL RESOURCES

A. Amtrak, in consultation with the signatories and other consulting parties and, if using FRA financial assistance for activities necessary to advance the Project toward and/or through construction, as directed by and under the authority of FRA, will mitigate Project effects on architectural historic properties according to the stipulations and procedures outlined below. Amtrak will initiate the architectural stipulations and complete the stipulations in accordance with the Project phasing and the deadlines established herein.

B. Preservation Grant Fund

1. Amtrak will establish, subject to available funding, which may include federal financial assistance, a Preservation Grant Fund not to exceed two million seven hundred fifty thousand dollars ($2,750,000.00), to be held and administered by Preservation Maryland for the purpose of providing direct financial assistance to individuals, organizations, and private developers toward Preservation Projects

involving exterior stabilization, repair, restoration, and rehabilitation of individual historic properties and contributing elements of historic districts listed in or eligible for listing in the NRHP. Preservation Projects eligible to receive funds through the Preservation Grant Fund will be limited to, and prioritized by, a two-tiered geographic area. First priority (Tier 1) will extend to eligible Preservation Projects located inside the boundary of the APE for the south portal as delineated on **Attachment 3**. Second priority (Tier 2) will extend to eligible Preservation Projects located inside the boundaries of both the Midtown Edmondson Historic District and the Edmondson Avenue Historic District as delineated on **Attachment 3**.

2. Financial allocations to the Preservation Grant Fund will be determined at the time all or part of activities necessary to advance the Project toward and/or through construction are funded and ready to advance (e.g., at the time design- and construction-related activities contracts/agreements are signed), including, for example, further design, acquisition of property for the Project, demolition of acquired properties, and construction, that are funded with any amount of financial assistance from FRA or any other non-federal funds.

3. Amtrak will deposit monies to the Preservation Grant Fund based upon a range of 0.1 to 0.25 percent of each awarded contract value, but not exceeding the specified maximum dollar amount. The Preservation Grant Fund will be sourced from the total funding committed to activities necessary to advance the Project toward and/or through construction, to the extent allowable by law and, if sourced by FRA financial assistance, consistent with FRA policy and applicable federal grant requirements (e.g., 2 CFR § 200, Uniform Administrative Requirements, Cost Principles and Audit Requirements for Federal Awards). All funds allocated to the Preservation Grant Fund will be distributed and spent, and all Preservation Projects and related administrative tasks will be completed, within five (5) years of the date that funding for the corresponding construction or construction-related activities was obligated, unless otherwise required by law. A portion of the Preservation Grant Fund may be used to cover the cost of its administration. The form, amount, and timing of each deposit (e.g., installment payment or lump-sum payment) into the Preservation Grant Fund will be at the discretion of Amtrak and any entity awarding financial assistance to Amtrak for the Project.

4. The financial assistance offered through the Preservation Grant Fund may vary in type, amount, and duration. It may consist of both full grants and grants with matching funds requirements, grants of different dollar amounts, and grants with different deadlines for completion.

5. Prior to providing funding to the Preservation Grant Fund, FRA, the MD SHPO, Amtrak, and Preservation Maryland, as the signatories, will draft a Fund Agreement governing the implementation and management of the Preservation Grant Fund. This draft Fund Agreement will be submitted to the concurring parties for review and comment following the steps described in Stipulation XI. The signatories will then execute the Fund Agreement. The final terms and conditions of the Fund Agreement

will be determined by the signatories, and will consider, as appropriate, the following:

a) A procedure for accommodating the administrative cost of implementing the Preservation Grant Fund;

b) Designation of the types, amounts, and durations of grants to be made available through the Preservation Grant Fund;

c) Criteria and procedures for applying for funds from the Preservation Grant Fund, including a requirement that all Preservation Projects adhere to the Secretary of the Interior's *Standards for the Treatment of Historic Properties*;

d) Criteria and procedures for selecting eligible Preservation Projects to fund, including coordination with CHAP regarding Baltimore City planning initiatives, and awarding grant dollars in support of the same;

e) A plan for advertising the Preservation Grant Fund to eligible applicants;

f) Requirements and procedures to account for the expenditure of awarded grants from the Preservation Grant Fund on Preservation Projects and for administrative costs, including steps for the accounting and auditing of funds according to generally accepted accounting principles or any other requirements of the signatories or other agencies providing funding for the Project;

g) Requirements and procedures for reporting on, completing, inspecting, and closing out Preservation Projects;

h) As appropriate, procedures for marketing and/or distributing salvaged materials obtained through the provisions of Stipulation V.H. herein for use in Preservation Projects;

i) Procedures for measuring and reporting progress on the implementation and administration of the Preservation Grant Fund;

j) Indemnification by Preservation Maryland of all contributors and signatories to the PA; and

k) Procedures for amending and terminating the Fund Agreement.

6. In the event that the Preservation Grant Fund cannot be established because a Fund Agreement is not established, Preservation Maryland is unwilling to accept the responsibilities of this provision, an alternate third-party Fund Administrator cannot be identified, or for any other reason, the signatories and consulting parties will consult to identify other means of mitigating the Project's adverse effects on historic properties, which will be documented and agreed upon in an amendment to this PA following the procedures in Stipulation XVI.

C. Context-Sensitive Design

1. Amtrak, in consultation with the MD SHPO, will develop and apply context-sensitive design treatments for specified new buildings and structures consistent with the standards and guidelines outlined in Stipulation IV.B. The treatments will be informed by, and responsive to, the significance and character-defining features of specified historic properties affected by the new construction and will include consideration of the form, scale, design, material, color, and texture of all exterior visible surfaces. Building and tunnel interiors are expressly exempted from this provision. Where a Project element is owned by a non-signatory to this PA that is unwilling to allow such design, Amtrak will have no obligation to accomplish context-sensitive design for that element.

2. The following table describes the only new construction elements to which context-sensitive design treatments will apply and the associated historic property or properties to which the designs will respond.

New Construction	Associated Historic Properties
CSX Railroad Bridge over Jones Falls Valley	B&O Railroad, Baltimore Belt Line; B&O Railroad Baltimore Belt Line Bridge over Jones Falls Valley
North Portal	B&P Railroad (Philadelphia, Baltimore and Washington Railroad)
Intermediate Ventilation Facility	Reservoir Hill Historic District; Bolton Hill Historic District
South Portal Cut-and-Cover Structure	B&P Railroad (Philadelphia, Baltimore and Washington Railroad); Midtown Edmondson Historic District
South Ventilation Facility	B&P Railroad (Philadelphia, Baltimore and Washington Railroad); Midtown Edmondson Historic District
Retaining Walls	B&P Railroad (Philadelphia, Baltimore and Washington Railroad)
Catenary Structures	B&P Railroad (Philadelphia, Baltimore and Washington Railroad)
Sound Barriers	Midtown Edmondson Historic District; Greater Rosemont Historic District; Edmondson Avenue Historic District; and/or B&P Railroad (Philadelphia, Baltimore and Washington Railroad)
Bridge BC 2410 (Lafayette Avenue over Amtrak)	Bridge BC 2410 (Lafayette Avenue over Amtrak); B&P Railroad (Philadelphia, Baltimore and Washington Railroad); Midtown Edmondson Historic District
Edmondson Avenue Bridge (BC 2405)	B&P Railroad (Philadelphia, Baltimore and Washington Railroad); Midtown

New Construction	Associated Historic Properties
	Edmondson Historic District;
West Franklin Street Bridge	B&P Railroad (Philadelphia, Baltimore and Washington Railroad)
West Baltimore MARC Station	B&P Railroad (Philadelphia, Baltimore and Washington Railroad)
West Mulberry Street Bridge	B&P Railroad (Philadelphia, Baltimore and Washington Railroad)
North Warwick Avenue Bridge	B&P Railroad (Philadelphia, Baltimore and Washington Railroad)
Franklintown Road Bridge	B&P Railroad (Philadelphia, Baltimore and Washington Railroad)

3. Amtrak will ensure individual historic properties and contributing elements of historic districts are clearly labeled on all relevant Project plan sheets.

4. Amtrak will prepare brief descriptions of the significance and character-defining features of each associated historic property and short bulleted recommendations for design guidance, consistent with the Secretary of the Interior's *Standards for the Treatment for Historic Properties* identified in Stipulation IV.B. Amtrak will share the design guidance with the signatories and concurring parties for review and comment following the steps described in Stipulation XI.

5. Amtrak will deliver to the signatories and concurring parties all 60 percent and 90 percent Project plan sheets and specification documents relevant to exterior design treatments under this stipulation for review and comment following the steps described in Stipulation XI. Amtrak will have the explicit right to limit consultation only to the signatories for design plan sheets Amtrak deems sensitive for security reasons. With the exception of FRA, recipients will be required to sign Non-Disclosure Agreements certifying confidentiality of the information shared through this process.

6. Amtrak will consider design review comments provided by the signatories and concurring parties, but ultimately is responsible for ensuring that the structural and engineering design of bridges and other structures meets engineering and safety standards for passenger and freight railroads.

D. Historic Properties Construction Protection Plan

1. Amtrak will prepare and enforce a Historic Properties Construction Protection Plan (Protection Plan) to protect against, monitor for, and manage construction-related effects to identified historic properties. The Protection Plan will apply to historic properties located inside, adjacent to, or above the Project limits of disturbance, stockpile locations, construction staging areas, tunneling zones, and any other area in which Project activities may take place.

2. At minimum, the Protection Plan will: identify and map all historic properties

subject to the Protection Plan; require security fencing; establish vibration thresholds; address potential ground displacements; provide monitoring; and create a publicly-accessible telephone hotline and emergency response procedure for reporting and addressing threats or physical damage to historic properties.

3. Amtrak will develop and distribute the draft Protection Plan with the 90 percent Project plan sheets and specification documents to the signatories and concurring parties for review and comment following the steps described in Stipulation XI. Amtrak will deliver the final Protection Plan with delivery of the 100 percent Project plan sheets and specification documents. Amtrak will have the explicit right to limit consultation only to the signatories for design plan sheets Amtrak deems sensitive for security reasons. With the exception of FRA, recipients will be required to sign Non-Disclosure Agreements certifying confidentiality of the information shared through this process.

E. Historic American Buildings Survey (HABS)/Historic American Engineering Record (HAER) Documentation

1. Amtrak will prepare individual HABS/HAER written and photographic documentation of individual and groups of historic properties and contributing elements to historic districts slated for demolition, for deposit with the National Park Service (NPS) and the MD SHPO. The final number of individual documents will vary, depending on the number of affected historic properties and contributing elements to historic districts. The documents will be organized around the following themes:

a) **B&O Railroad Baltimore Belt Line Bridge over Jones Falls Valley:** A HAER recordation of this historic property will focus on the bridge, which is both individually eligible for the NRHP and a contributing element of the B&O Railroad Baltimore Belt Line. Photographic documentation will record the complete bridge structure, setting, and wider railroad corridor within the vicinity of Jones Falls Valley. Written documentation will focus on the history of the B&O Railroad Baltimore Belt Line, its construction, and the story behind the final location, design, engineering, and method of construction used for building the B&O Railroad Baltimore Belt Line Bridge over Jones Falls Valley.

b) **B&P Railroad (Philadelphia, Baltimore and Washington Railroad):** HAER recordations involving the B&P Railroad and its contributing elements will focus on above-ground railroad-related structures within the B&P Railroad right-of-way between Gwynns Falls and Baltimore's Pennsylvania Station. The photographic documentation will record such elements as overviews of the current right-of-way (including embankments, cuts, retaining walls, industrial sidings, and catenary system). The written documentation will address the railroad's overall construction and evolution, emphasizing the story behind its location, design, engineering, and method of construction. More detailed HAER recordations of the contributing West Franklin Street Bridge, West Mulberry Street Bridge, North Warwick Avenue Bridge, and Franklintown Road Bridge will include photographic documentation of each structure and its individual setting and structural system. Written documentation will focus on each bridge,

its history and design, and the reasons for its construction. The existing B&P Tunnel is not a part of the Project and is not included in this recordation effort.

c) **Midtown Edmondson Commercial and Industrial Corridor:** HABS recordations involving commercial and industrial properties flanking the B&P Railroad inside the Midtown Edmondson Historic District will include photographic documentation of building exteriors, interiors (if accessible), and settings. The written documentation will address each recorded property within the context of twentieth-century development of the corridor, its relationship to the railroad, the role the property played in the history of the wider Midtown Edmondson Historic District, and more specific information on the building's design, materials, construction techniques, builders, and occupants. Specific historic properties and contributing elements identified for recordation include: the Warehouse at 2020 Mosher Street; the Living Word Church of Deliverance (2100 West Lanvale Street); a storage warehouse (740 North Pulaski Street); the Faith Christian Worship Center (700 North Pulaski Street); the Atlas Safe Deposit and Storage Company Warehouse Complex; the Ward Baking Company; the B&P Railroad Edmondson Avenue Station (2235 Edmondson Avenue); the trade school building (2237 Edmondson Avenue); Fire Department Engine House No. 36; and the automotive service garage (501 North Bentalou Street).

d) **Midtown Edmondson Railroad Grade Separations:** HAER recordations focusing on Bridge BC 2410 (Lafayette Avenue over Amtrak) and/or Bridge BC 2405 (Edmondson Avenue over Amtrak) will include photographic documentation of each complete bridge structure and setting. Written documentation will focus on the history of each bridge, emphasizing the general story of railroad grade separations in Baltimore City and the reasons leading to the final location, design, engineering, and method of construction used for each structure.

e) **Midtown Edmondson Rowhouses:** HABS recordations focusing on residential rowhouses slated for demolition inside the Midtown Edmondson Historic District will include photographic documentation of the overall affected blocks, their settings, and more detailed exterior and interior (if accessible) photographs of the individual building units, ancillary buildings, and yards to be demolished. The written documentation will focus on a general history of residential development within the targeted blocks and more specific information on the design, materials, construction techniques, builders, and past and current occupants of the individual residences to be recorded. This effort will be limited to residential buildings subject to demolition, which at present involves the block of residences located on the west side of North Payson Street between Riggs Avenue and Mosher Street, and the block of residences located on the south side of West Lanvale Street between Pulaski and North Payson Streets.

f) **Greater Rosemont Rowhouses:** HABS recordations focusing on residential rowhouses slated for demolition inside both the Greater Rosemont and Edmondson Avenue Historic Districts will include photographic documentation of the overall affected block, its setting, and more detailed exterior and interior (if accessible) photographs of the individual units to be demolished. The written documentation will focus on a general history of residential development within the targeted block and more specific information on the design, materials, construction techniques, builders, and past and current occupants of the individual residences to be recorded. This effort will be limited to residential buildings subject to demolition, which at present involves two residences located on the south side of Lauretta Avenue at the intersection of North Bentalou Street (2301 Lauretta Avenue and 2303 Lauretta Avenue).

g) **Reservoir Hill Commercial Building:** This HABS recordation will focus on the commercial building slated for demolition at 900-908 West North Avenue, a contributing element inside the Reservoir Hill Historic District. The photographic documentation will record the exterior, interior (if accessible), and setting of the individual building to be demolished. The written documentation will focus on the role the building played in the development of West North Avenue as a commercial corridor during the first half of the twentieth century, and more specific information on the building's design, materials, construction techniques, builders, and occupants.

2. Amtrak will consult with the NPS Northeast Region HABS/HAER office on the final scope, content, format, and disposition of each recordation effort. This includes consideration of a procedure for an interim submission of the photographic documentation for NPS review and approval, in order to release the buildings for demolition and construction activities prior to completion of the remaining recordation package. The photographic documentation will be prepared using digital images consistent with Level II HABS/HAER photography guidelines contained in Stipulation IV.B.

3. Where possible, the written documentation will draw upon original construction documents, historic photographs, and oral interviews with local residents or individuals possessing special knowledge. Potential repositories to consult for information on individual buildings, structures, and railroad resources include, but are not limited to, the Amtrak archive, National Archives, Maryland State Archives, Maryland Historical Society, Pennsylvania State Archives, Baltimore City Archives, and Enoch Pratt Free Library.

4. As relevant, the content will draw upon research and documentation carried out as part of the interpretive displays (Stipulation V.F.) and railroad boundary clarifications (Stipulation V.G.) conducted as part of this PA.

5. Amtrak will initiate each HABS/HAER recordation when funds are committed for activities necessary to advance the Project toward and/or through construction that will

affect historic properties and/or contributing elements to historic districts and will complete the photographic recordation phase prior to the initiation of mothballing, demolition, and/or construction activities associated with the historic property or contributing element to be documented. Amtrak will leave each building or structure and its associated parcel of land in an unaltered appearance until the photographic documentation phase is completed.

6. Unless otherwise agreed to by the NPS and the MD SHPO, Amtrak will ensure that all documentation is completed and accepted by HABS/HAER prior to the commencement of construction or demolition activities associated with the historic property or contributing element to be documented.

7. Unless otherwise agreed to by the NPS and the MD SHPO, Amtrak will provide final copies of each recordation document to the NPS and the MD SHPO, and offer copies to the Maryland State Archives, Maryland Historical Society, and Enoch Pratt Free Library. Copies of railroad-specific recordation documents also will be offered to the B&O Railroad Museum, and the Pennsylvania Railroad Technical & Historical Society.

F. Interpretive Displays

1. Amtrak will develop, fabricate, install, and maintain up to two (2) interpretive signs and/or displays to be located at Baltimore City's Pennsylvania Station or other appropriate publicly accessible gathering place. The final number, form, location, content, and design-life of the interpretive displays will be decided in consultation among the signatories and concurring parties. Possible interpretive themes for the displays include, but are not limited to, the history and construction of the original B&P Railroad and tunnel; the role of the Pennsylvania Railroad in Baltimore City; the influence of railroads generally on Baltimore City, its neighborhoods, and people; the construction of the new tunnel; and/or archeological discoveries resulting from the Project.

2. To the extent possible, the content will draw upon research and documentation carried out as part of the HABS/HAER recordation (Stipulation V.E.), railroad boundary clarifications (Stipulation V.G.), and archeological studies (Stipulation VI) prescribed in this PA. This includes any oral interviews with local residents or individuals possessing special knowledge.

3. Amtrak will submit draft and final outlines, text copy, exhibition scripts, and/or design documents to the signatories and concurring parties for review and comment following the steps described in Stipulation XI.

4. Amtrak will install the interpretive display(s) within two (2) years of the signing of the Project construction contracts. Amtrak will maintain the interpretive display(s) until the completion of Project construction.

G. Railroad Historic Property Boundary Clarifications

1. Amtrak will investigate the history, development, use, and evolution of the station facilities and adjoining yards comprising present-day Pennsylvania Station in Baltimore City, for the purposes of clarifying and delineating the official boundaries of railroad-related NRHP-listed and eligible historic properties. The boundary investigation will focus on the area of railroad right-of-way between East North Avenue and Greenmount Avenue. For the purposes of establishing an historic context, specific attention will focus on the following railroads that historically utilized Pennsylvania Station: Northern Central Railroad; B&P Railroad; Union Railroad Company of Baltimore; Western Maryland Railroad; Maryland and Pennsylvania Railroad; Philadelphia, Wilmington and Baltimore Railroad; and Philadelphia, Baltimore and Washington Railroad. Previously identified historic properties requiring clarifications include, but are not limited to, the following: Philadelphia, Wilmington & Baltimore Railroad (B-5164 and AA-1097); Union Railroad (B-5163); Northern Central Railway Engineering Structures Historic District (B-1305 and BA-2874); and Pennsylvania Station (B-3727).

2. Amtrak will consult with the MD SHPO on the final scope and format of the boundary clarifications effort. Examples of appropriate formats include, but are not limited to, addendums to the MD SHPO Maryland Inventory of Historic Properties Forms or Determination of Eligibility Forms. The boundary clarifications will include accompanying geo-referenced map layers linked to current tax parcel boundaries.

3. As relevant, the content will draw upon research and documentation from the HABS/HAER recordation and interpretive displays stipulations (Stipulations V.E. and V.F.) in this PA.

4. Amtrak will submit drafts of the boundary clarifications effort to the signatories and concurring parties for review and comment, following the steps described in Stipulation XI. The final document will be filed with the MD SHPO.

H. Salvage Building Components

1. Amtrak will secure, stockpile, and make available historic building materials salvaged from the Project-related demolition of buildings constituting individual historic properties and/or contributing elements of historic districts.

2. After purchase of the properties, but prior to demolition activities, Amtrak will engage a qualified professional(s) meeting the Secretary of the Interior's *Professional Qualification Standards for Archeology and Historic Preservation* in the disciplines of Architectural History or Historic Architecture to examine each building slated for demolition and identify materials recommended for salvage. Examples of appropriate salvage materials include, but are not limited to: decorative roofing, decorative metal work, stone front steps, stone stoops, stone/terra cotta coping, stone sills, stone lintels, exterior principal façade brick, cornices, window sashes, doors, architraves, balusters, newels, stair rails, hearth stones, and fireplace surrounds.

3. Amtrak will make a reasonable and good-faith effort to ensure standard care is used in removing the materials identified for salvage, transporting them to storage, and securing them from vandalism, theft, and weather, in accordance with all applicable statues and regulations. If salvage items are found to possess or are judged likely to be contaminated by hazardous material or waste, Amtrak may withdraw the material without making it available for use and dispose of the same in accordance with applicable statutes and regulations. However, Amtrak will not be required to affirmatively certify the condition of salvaged material as safe or appropriate for any particular use.

4. Amtrak will hold the salvaged material for a period of twelve (12) months from the time it is placed into storage, and make it available free of charge and during reasonable hours to parties who present adequate proof of residence or involvement in the rehabilitation or renovation of properties within the Midtown Edmonson or Greater Rosemont Historic Districts, and/or to Preservation Grant Fund recipients, if the Preservation Grant Fund is established and funded at such time that salvaged materials are available. At the end of the retention period, Amtrak may sell or dispose of the remaining unused materials in accordance with applicable statutes and regulations.

5. Amtrak will provide for a means of notifying the public as to the availability of the salvaged material. Amtrak will provide all materials for salvage on an "as-is, where-is" basis, and will make no warranty as to condition, suitability, serviceability, or degree of contamination for any intended subsequent use. Amtrak will prepare and deliver a written receipt to that effect to every recipient for their review and signature, and the receipts will become a part of the official Project record. Recipients will sign a release indemnifying Amtrak and other signatories of this PA against any and all claims arising from the acquisition and use of received salvaged materials.

6. Amtrak will consult with the signatories and concurring parties on the materials proposed for salvage, and the provisions and procedures for notification to the public of the availability of salvage materials, following the steps outlined in Stipulation XI. Amtrak will incorporate the same into its final plans and specifications for the removal and staging/storage of the salvaged materials.

I. Electronic Informational Platforms

1. Amtrak will add a new section concerning the PA implementation to the existing Project website. The purpose of this stipulation is to provide a platform for the electronic storage and public dissemination of information and content on Project activities and findings related to historic architecture and archeology, including, but not limited to, identified historic properties, Project effects, and mitigation measures addressed in this PA. Examples of content include, but are not limited to, information on preservation grant funding, HABS/HAER documentation, interpretive content and materials, oral histories, salvage efforts and availability, and archeology.

2. Amtrak will consult with the signatories and concurring parties on the final scope and format of the new PA implementation section, including opportunities to partner

with, and hyperlink to, other relevant preservation/history-based organizations or to utilize other forms of electronic communication.

3. Amtrak will initiate this stipulation at the start of the Project design phase and will maintain and update the PA implementation section, as needed, until Project completion or the termination of the Project.

VI. TREATMENT MEASURES FOR ARCHEOLOGICAL RESOURCES

A. Amtrak, in consultation with the signatories and other consulting parties, will identify and assess Project effects on archeological historic properties according to the stipulations and procedures outlined below. Amtrak will initiate the archeological stipulations and complete the stipulations, including mitigation measures, in accordance with the Project phasing and the deadlines established herein. If using FRA financial assistance for activities necessary to advance the Project toward and/or through construction, Amtrak will complete mitigation measures as directed by and under the authority of FRA. Amtrak will ensure that no ground disturbing activities associated with the Project take place in areas subject to archeological investigation until required fieldwork is completed and approved by the MD SHPO and the location is formally released for ground disturbing activities.

B. Define Archeological APE

In consultation with FRA and the MD SHPO, Amtrak, will define the Project APE for archeology (36 CFR § 800.16(d)). The archeological APE will include the Project's limits of disturbance, which consists of the area in which ground disturbance is expected to take place, and can include excavation sites, construction staging areas, material disposal sites, temporary access roads, utility and storm water management sites, and off-site mitigation sites. The archeological APE is subject to change as Project plans advance.

C. Supplemental Phase I Survey

1. At such time that Amtrak commences additional phases of engineering design, and subject to available funding but no later than when funding is available for final design, Amtrak, will conduct a Supplemental Phase IA archeological survey to update the initial Phase IA archeological survey completed in October 2015, and to further refine the archeological context, sensitivity, and predictive models for the location of potential sites within the archeological APE.

2. Amtrak will prepare and submit a technical document containing the results of the Supplemental Phase IA archeological survey, together with proposed recommendations and required work plans for Phase IB testing surveys, if any, to FRA for review. Upon FRA's approval, Amtrak will submit the Phase IA document to the MD SHPO and other consulting parties for review and comment following the steps described in Stipulation XI.

3. Amtrak will complete one or more Phase IB survey(s), as appropriate, to identify archeological resources.

4. Amtrak will prepare and submit a technical document(s) containing the results of each Phase IB survey, together with proposed recommendations and required work plans for Phase II survey, if any, to FRA for review. Upon FRA's approval, Amtrak will submit the Phase IB document(s) to the MD SHPO and other consulting parties, as appropriate, for review and comment following the steps described in Stipulation XI.

D. Phase II Evaluation

1. Amtrak will complete one or more Phase II survey(s), as appropriate, to evaluate the NRHP eligibility of any intact archeological resources that may be affected by the Project.

2. Amtrak will prepare and submit a technical document(s) containing the results of each Phase II survey, together with proposed NRHP eligibility recommendations, to FRA for review. Upon FRA's approval, Amtrak will submit the Phase II document(s) to the MD SHPO and other consulting parties, as appropriate, for review and comment following the steps described in Stipulation XI. The technical document(s) may be combined with the effects assessment as outlined in Stipulation VI.D.3., below.

3. Amtrak will prepare one or more document(s) containing a proposed assessment of Project effects on archeological historic properties according to the criteria of adverse effects (36 CFR § 800.5), and submit the document(s) to FRA for review. Upon FRA's approval, Amtrak will submit the effects assessment document(s) to the MD SHPO and other consulting parties, as appropriate, for review and comment following the steps described in Stipulation XI. If FRA, in consultation with the signatories and other consulting parties, determines that an archeological historic property will be adversely effected by the Project, the signatories and other consulting parties, as appropriate, will consult on strategies to avoid, minimize, or mitigate the adverse effect. Examples include, but are not limited to, avoidance, protection, alternative mitigation, or data recovery. The effects assessment may be combined with the technical document as outlined in Stipulation VI.D.2., above.

4. Amtrak will memorialize the approach and treatment measures to resolve adverse effects to archeological historic properties in a document submitted to the signatories and other consulting parties, as appropriate, for review and comment following the steps described in Stipulation XI.

5. Upon FRA's approval of the approach and treatment measures memorialized in accordance with Stipulation VI.D.4., above, Amtrak will carry out the approach and treatment measures.

E. Phase III Data Recovery

1. If an adverse effect cannot be avoided or alternatively mitigated, Amtrak, in consultation with signatories and other consulting parties, will mitigate the adverse effect through a program of data recovery.

2. Amtrak will prepare and submit one or more plan(s) for conducting Phase III data recoveries to the signatories and other consulting parties, as appropriate, for review and comment following the steps described in Stipulation XI. At a minimum, each data recovery plan will include:

a) A list of research questions to be addressed, with a discussion of their relevance and importance;

b) Methods to be used for fieldwork and laboratory analysis, with a justification of their cost-effectiveness and how they apply to the particular sites and the research questions;

c) A schedule for completing field and laboratory work, and submitting draft and final documents for the MD SHPO's review and comment;

d) Methods to be used in managing and curating artifacts, data, and other records;

e) Procedures for evaluating and treating unanticipated discoveries consistent with the provisions of Stipulation VIII;

f) A procedure for documenting the completion of fieldwork and releasing sites for construction activities; and

g) Provisions for disseminating the research findings to other consulting parties, professional peers, and the general public.

3. Upon FRA's approval of the data recovery plan in accordance with Stipulation VI.E.2., above, Amtrak will execute the Phase III data recovery plan(s).

F. Curation

Amtrak, in coordination with FRA, will curate all materials and records resulting from archeological investigations conducted for the Project in accordance with 36 CFR § 79 at the Maryland Archeological Conservation Laboratory (MAC Lab), unless Amtrak cannot obtain clear title, Deed of Gift, or curation agreement for the collection. Amtrak will consult with FRA and the MD SHPO regarding the appropriate disposition of any materials or records not proposed for curation at the MAC Lab.

G. Protection of Archeologically-Sensitive Information

Amtrak will submit copies of all final archeological documents stipulated in this PA to FRA and the MD SHPO. Interim and final archeological documents and related documentation will be distributed to other consulting parties and qualifying agencies only upon request, and in redacted form, as appropriate, in order to ensure the security of archeological sites.

VII. PROJECT CHANGES

A. Amtrak will afford the signatories and other consulting parties the opportunity to review and comment on Project changes that are of a nature that could potentially affect historic properties. Amtrak will submit written documentation, including Project plan sheets or sketches showing the modification, a brief explanation why the change is needed, and a plan for any proposed Section 106 work, to the signatories and other consulting parties for review and comment following the steps described in Stipulation XI.

B. Historic Architecture

1. As needed, and with assistance from FRA and the MD SHPO, Amtrak will refine an APE in consultation with the signatories and other consulting parties. Amtrak will conduct an architectural survey to identify historic properties listed in or eligible for listing in the NRHP, and prepare and submit one or more technical document(s) containing the results of the architectural survey, together with the proposed identification of historic properties and recommendations for next steps, if any, to FRA for review. Upon FRA's approval, Amtrak will submit the document(s) to the MD SHPO and other consulting parties, as appropriate, for review and comment following the steps described in Stipulation XI.

2. Amtrak will prepare one or more document(s), containing a proposed assessment of Project effects on architectural historic properties according to the criteria of adverse effects (36 CFR § 800.5), and submit the document(s) to FRA for review. Upon FRA's approval, Amtrak will submit the effects assessment document(s) to the MD SHPO and other consulting parties, as appropriate, for review and comment following the steps described in Stipulation XI. If FRA, in consultation with the signatories and other consulting parties, determines that an architectural historic property will be adversely effected by the Project, then the signatories and other consulting parties will consult on strategies to avoid, minimize, or mitigate the adverse effect.

3. Amtrak will memorialize the approach and treatment measures to resolve adverse effects to architectural historic properties in one or more document(s) submitted to the signatories and other consulting parties, as appropriate, for review and comment following the steps described in Stipulation XI.

4. Upon FRA's approval of the approach and treatment measures memorialized in accordance with Stipulation VII.B.3., above, Amtrak will carry out the approach and treatment measures.

C. Archeology

Project modifications with the potential to impact archeological deposits will be addressed pursuant to Stipulation VI.

VIII. UNANTICIPATED DISCOVERIES

A. Amtrak will develop an Unanticipated Discoveries Plan (UDP) to be included in construction and bidding documents for contractor/team use in the event of unanticipated discoveries. The plan will incorporate a procedure for interacting with the media, a chain

of contact, and other relevant provisions, as needed. Amtrak will submit the UDP to the MD SHPO and FRA for review and comment following the steps described in Stipulation XI.

B. In the event any previously unidentified historic architectural or archeological resource is discovered, Amtrak will require the contractor to halt all work in the area of the resource. For any discovered archeological resources, Amtrak will also halt work in surrounding areas where additional subsurface remains can reasonably be expected to be present. Work in all other areas of the Project may continue.

C. Amtrak will notify the signatories, and other consulting parties, and FRA will notify appropriate federally recognized Native American tribes, if appropriate, within 48 hours of the discovery (36 CFR § 800.13(b)(3)). As needed, FRA will also identify and invite other consulting parties to confer on unanticipated discoveries.

D. Amtrak, in consultation with the signatories and other consulting parties, will investigate the discovery site and resource(s) according to the professional standards and guidelines contained in Stipulation IV. Amtrak will prepare and submit a written document containing a proposed determination of NRHP eligibility of the resource, an assessment of Project effects on historic properties, if appropriate, and any recommended treatment measures to FRA for review. Upon FRA's approval, Amtrak will submit the determination of NRHP eligibility, effects assessment, and/or recommended treatment measures document, if appropriate, to the MD SHPO and other consulting parties, as appropriate, for review and comment. If the potential resource is associated with Native American prehistory or history, FRA will provide the documentation to federally recognized Native American tribes within five (5) working days for their review with a request for comment. The signatories, other consulting parties, and federally recognized Native American tribes, if participating, will respond with any comments within five (5) working days of receipt.

E. If it is necessary to develop treatment measures in accordance with Stipulation VIII.D., above, Amtrak will carry out the approach and treatment measures after approval by FRA.

F. Amtrak will ensure construction work within the affected area does not proceed until FRA, in consultation with the MD SHPO and federally recognized Native American tribes, as appropriate, determines that either 1) the located resource is not NRHP-eligible or 2) the agreed upon treatment measures for historic properties have been implemented.

IX. TREATMENT OF HUMAN REMAINS

A. If human remains are encountered during archeological investigations or construction, Amtrak will require the contractor to immediately halt subsurface disturbance in that portion of the Project area and immediately secure and protect the human remains and any associated funerary objects in place in such a way that minimizes further exposure or damage to the remains from the elements, looting, and/or vandalism.

B. Amtrak will immediately notify the Baltimore City Police Department to determine if the discovery is subject to a criminal investigation by law enforcement, and notify the signatories within twenty-four (24) hours of the initial discovery.

C. If a criminal investigation is not appropriate, Amtrak will apply and implement all relevant laws, procedures, policies, and guidelines contained in Stipulation IV.B. concerning the treatment and repatriation of burial sites, human remains, and funerary objects.

D. In the event the human remains encountered could be of Native American origin, whether prehistoric or historic, FRA will immediately notify the appropriate federally recognized Native American tribes and MCIA, and consult with them and the MD SHPO to determine the treatment plan for the Native American human remains and any associated funerary objects.

E. If the remains are not of Native American origin, Amtrak will, as appropriate, develop a research design/treatment plan for the appropriate treatment of the remains and any associated artifacts, consistent with procedures and guidelines contained in Stipulation IV.B. and submit the design and plan for review and comment by the signatories and other consulting parties following the steps described in Stipulation XI.

F. Amtrak will ensure the contractor will not proceed with work in the affected area until FRA, in consultation with the MD SHPO and federally recognized Native American tribes, as appropriate, determines the development and implementation of an appropriate research design/treatment plan or other recommended mitigation measures are completed. However, work outside the area may continue.

X. EMERGENCY SITUATIONS

A. Should an emergency situation occur that represents an imminent threat to public health or safety, or creates a hazardous condition and has the potential to affect historic properties, Amtrak will contact the Baltimore City Police Department, as needed, as soon as possible and notify the signatories and other consulting parties within twenty-four (24) hours of the condition which created the emergency, the immediate action taken in response to the emergency, the effects of the response to historic properties, and, where appropriate, further plans to address the emergency. This will include any further proposals to avoid, minimize, or mitigate potential adverse effects to historic properties.

B. The signatories and other consulting parties will have seven (7) days to review and comment on the plan(s) for further action. If FRA, the MD SHPO, and other consulting parties do not object to the plan within the review period, then Amtrak will implement the proposed plan(s).

C. Where possible, Amtrak will ensure that emergency responses allow for future preservation or restoration of historic properties, take into account the Secretary of the Interior's *Standards for the Treatment of Historic Properties*, and include on-site monitoring by the appropriate qualified professional as contained in Stipulation IV.

D. Immediate rescue and salvage operations conducted to preserve life or property are exempt from these and all other provisions of this PA.

XI. DOCUMENT REVIEW

A. Unless otherwise stated elsewhere in this PA, the signatories, other consulting parties, and/or concurring parties will provide comments on the documents they review to either FRA or Amtrak, as appropriate, and as set forth herein.

B. The signatories, other consulting parties, and/or concurring parties will have up to thirty (30) calendar days from the date of receipt to review and provide written comments to FRA or Amtrak on documents stipulated in this PA.

C. FRA and/or Amtrak will ensure any written comments received within the timeframe are considered and incorporated, as appropriate, into the documentation.

D. If the signatories, other consulting parties, and/or concurring parties do not submit written comments to FRA and/or Amtrak within thirty (30) calendar days of receipt of any document, it is understood the non-responding parties have no comments on the submittal.

E. If the signatories, other consulting parties, and/or concurring parties object to or recommend extensive revisions to submissions stipulated in the PA, FRA and/or Amtrak will work expeditiously to respond to the recommendations and resolve disputes.

F. If FRA and/or Amtrak cannot resolve the disputes, and if further consultation with the signatories, other consulting parties, and/or concurring parties is deemed unproductive by any party, the parties will adhere to the dispute resolution procedures detailed under Stipulation XV, below.

G. The signatories, other consulting parties, and/or concurring parties acknowledge the timeframes set forth in this PA will be the maximum allowed under normal circumstances. In exigent circumstances (e.g., concerns over construction suspensions or delays), all parties agree to expedite their respective document review and dispute resolution obligations.

XII. COMMUNICATIONS

Either paper or electronic mail (email) will serve as the official method of correspondence for all communications regarding this PA and its provisions. **Attachment 5** contains a list of signatories and concurring parties with contact information. Contact information may be updated, as needed, without an amendment to this PA. It is the responsibility of each signatory, consulting party, and/or concurring party to immediately inform FRA and Amtrak of any change in name or contact information for any point of contact. Amtrak will forward this information to all signatories, other consulting parties, and concurring parties by email.

XIII. ANTI-DEFICIENCY ACT

FRA's obligations under this PA are subject to the availability of appropriated funds, and

the stipulations of this PA are subject to the provisions of the Anti-Deficiency Act (31 U.S.C. § 1341). FRA will make reasonable and good faith efforts to secure the necessary funds to implement this PA in its entirety. If compliance with the Anti-Deficiency Act alters or impairs FRA's ability to implement the stipulations of this agreement, or if another federal agency does not assume responsibility as lead federal agency, signatories will consult in accordance with the amendment or termination procedures found in Stipulations XVI and XVII of this PA.

XIV. ADOPTABILITY

In the event that another federal agency not initially a party to the PA receives an application for funding/license/permit for the Project as described in this PA, that agency may fulfill its Section 106 responsibilities by stating in writing it concurs with the terms of this PA and notifying the signatories that it intends to do so. Such an agreement will be evidenced by the execution of a signature page to this PA and filing with the ACHP, and implementation of the terms of this PA.

XV. DISPUTE RESOLUTION

A. In the event any signatory, consulting party, and/or concurring party objects in writing to any actions proposed or the manner in which the terms of this PA are implemented, FRA will first consult with the objecting party and other signatories, other consulting parties, and/or concurring parties as appropriate, within thirty (30) calendar days to resolve the objection. If FRA determines that such objection cannot be resolved, FRA will proceed as set forth herein. The form, amount, and timing of each deposit (e.g., installment payment or lump-sum payment) into the Preservation Grant Fund are not subject to this stipulation.

B. FRA will forward all documentation relevant to the dispute, including FRA's proposed resolution, to the ACHP within fifteen (15) calendar days of the determination and request that the ACHP provide FRA with its advice on the resolution of the objection within thirty (30) calendar days of receiving the documentation. Concurrently, FRA will also provide the signatories, other consulting parties, and/or concurring parties with the same documentation for review and comment following the steps described in Stipulation XI. FRA will prepare a written response to the objection, which will constitute FRA's decision regarding the objection, that takes into account any timely advice or comments regarding the dispute from the ACHP, signatories, other consulting parties, and/or concurring parties, and provide them with a copy of the written response. FRA will then proceed according to its decision.

C. If the ACHP does not provide its advice regarding the dispute within the thirty (30) calendar day time period, FRA may make a decision on the dispute and proceed accordingly. FRA will document this decision in a written response to the objection that takes into account any timely comments regarding the dispute from the signatories, other consulting parties, and/or concurring parties and provide the ACHP, signatories, other consulting parties, and/or concurring parties with a copy of such written response.

D. Should disputes arise under exigent circumstances (e.g., concerns over construction

suspensions or delays), all parties agree to expedite their respective document review and dispute resolution obligations.

E. The signatories remain responsible for carrying out all other actions subject to the terms of this PA that are not the subject of the dispute.

XVI. AMENDMENTS

Any signatory to this PA may request that it be amended, whereupon that party will immediately consult with the other signatories within thirty (30) calendar days (or another time period agreed to by all signatories) to consider such an amendment. FRA will be responsible for developing and executing any resulting amendment among the signatories in the same manner as the original PA. The amendment will be effective on the date FRA files a copy signed by all signatories with the ACHP.

XVII. TERMINATION

A. If any signatory to this PA determines its terms will not or cannot be carried out, that party will immediately consult with the other signatories to attempt to develop an amendment per Stipulation XVI. If within thirty (30) calendar days (or another time period agreed to by all signatories) an amendment cannot be reached, any signatory may terminate the PA upon written notification to the other signatories.

B. If the PA is terminated, then, prior to work continuing on the Project, FRA must either, 1) execute a new Memorandum of Agreement or PA (36 CFR § 800.6(c) or 800.14(b)) or 2) request, take into account, and respond to the comments of the ACHP under 36 CFR § 800.7. FRA will notify the signatories and other consulting parties as to the course of action it will pursue.

XVIII. MONITORING AND REPORTING

A. Each year, following the effective date of this PA until it expires or is terminated, Amtrak will provide the signatories, other consulting parties, and/or concurring parties a written report summarizing work undertaken and any tasks completed pursuant to its terms. Such a report will include any scheduling changes proposed, problems encountered, and disputes and their resolution in the signatories' efforts to carry out the terms of this PA.

B. Amtrak will provide email notification to FRA's Federal Preservation Officer ten (10) business days before commencing the following activities necessary to advance the Project toward and/or through construction: acquisition of property, demolition of acquired property, excavation/earthmoving activities, and construction of any element of the Project.

XIX. EXECUTION AND EFFECTIVE DATE

This PA will go into effect on the date FRA signs the document, which will be the final signature among all the signatories. Execution of this PA by the signatories, its subsequent filing with the ACHP, and implementation of its terms demonstrate FRA has taken into account the effect of the Project on historic properties and afforded the ACHP an

opportunity to comment.

XX. DURATION

This PA will expire when all its stipulations have been completed or in ten (10) years from the effective date, whichever comes first, unless the signatories agree in writing to an extension using the amendment stipulation (Stipulation XVI) herein.

SIGNATORIES
Federal Railroad Administration
Maryland State Historic Preservation Officer

INVITED SIGNATORIES
National Railroad Passenger Corporation
Preservation Maryland

OTHER CONSULTING PARTIES (INVITED TO BE CONCURRING PARTIES)
Delaware Tribe of Indians (Federally Recognized Tribe)
Shawnee Tribe (Federally Recognized Tribe)
Baltimore City Commission for Historical and Architectural Preservation
Baltimore City Department of Transportation
Baltimore City Planning Department
Baltimore Heritage
Baltimore Heritage Area Association, Inc.
Historic Mount Royal Terrace Association
Maryland Commission on Indian Affairs
Maryland Department of Transportation
Maryland Transit Administration
Midtown Edmondson Improvement Association
Mount Royal Improvement Association

SIGNATORIES AND INVITED SIGNATORIES

FEDERAL RAILROAD ADMINISTRATION

By: Marlys A Osterhues Date: 3/2/2017
Marlys Osterhues
Division Chief, Environmental and Corridor Planning Division

MARYLAND STATE HISTORIC PRESERVATION OFFICER

By: Elizabeth Hughes Date: 2.28.2017
Elizabeth Hughes
State Historic Preservation Officer

NATIONAL RAILROAD PASSENGER CORPORATION

By: C.W. Moorman Date: 2/27/17
Charles W. Moorman
President and Chief Executive Officer

PRESERVATION MARYLAND

By: Nicholas A. Redding Date: 2/8/2017
Nicholas A. Redding
Executive Director

APPROVED AS TO FORM:

BY: _____
Counsel for National Railroad
Passenger Corporation

CONCURRING PARTY

DELAWARE TRIBE OF INDIANS (FEDERALLY RECOGNIZED TRIBE)

By: _____ Date: _____
Chester Brooks
Chief

CONCURRING PARTY

SHAWNEE TRIBE (FEDERALLY RECOGNIZED TRIBE)

By: _____ Date: _____

Ron Sparkman
Chairman

CONCURRING PARTY

BALTIMORE CITY COMMISSION FOR HISTORICAL AND ARCHITECTURAL PRESERVATION

By: _____ Date: 2/21/2017

Eric Holcomb
Executive Director

CONCURRING PARTY

BALTIMORE CITY DEPARTMENT OF TRANSPORTATION

By: Frank Murphy Date: 3/3/17

Frank Murphy
Acting Director

CONCURRING PARTY

BALTIMORE CITY PLANNING DEPARTMENT

By: _____ Date: 2/17/17

Thomas J. Stosur
Director

CONCURRING PARTY

BALTIMORE HERITAGE

By: _____ Date: February 16, 2017
Johns W. Hopkins
Executive Director

CONCURRING PARTY

BALTIMORE HERITAGE AREA ASSOCIATION, INC.

By: _____ Date: 2/8/17

Jeffrey Buchheit
Executive Director

CONCURRING PARTY

HISTORIC MOUNT ROYAL TERRACE ASSOCIATION

By: _____ Date: _____
Greg Grenier
President

CONCURRING PARTY

MARYLAND COMMISSION ON INDIAN AFFAIRS

By: _____ Date: _____

E. Keith Colston
Administrative Director

CONCURRING PARTY

MARYLAND DEPARTMENT OF TRANSPORTATION

By: _____ Date: 2/22/17

Bradley Smith
Director of the Office of Freight and Multimodalism

CONCURRING PARTY

MARYLAND TRANSIT ADMINISTRATION

By: _____ Date: 2/8/17

Kevin Quinn
Director of the Office of the Office of Planning and Programming

CONCURRING PARTY

MIDTOWN EDMONDSON IMPROVEMENT ASSOCIATION

By: _____Date: _____
Zelda Robinson

CONCURRING PARTY

MOUNT ROYAL IMPROVEMENT ASSOCIATION

By: Michael Marcus Date: 3/3/17

~~Steve Howard~~ Michael Marcus
President

ATTACHMENTS

Attachment 1: Project Location Map

Attachment 2: Overview, Area of Potential Effects and Historic Properties

Attachment 3: Preservation Grant Fund Tier Areas

Attachment 4: List of Prior Technical Studies

Attachment 5: List of Contacts

Liberty Square
Burleith Leighton
Hanlon Longwood
Druid Hill Park
Intermediate Ventilation Facility
Remington
CSX
Better Waverly
Charles Village
North Ventilation Facility
East Baltimore Midway
Barclay
Gwynns Falls Pwy
Mondawmin
Reservoir Hill
Penn North
McCulloh St
Preferred Alternative
Walbrook
W North Ave
3B
Druid Hill Ave
Charles North
Penn Station
Existing B & P Tunnel
McMechen St
Amtrak Northeast Corridor
Coppin Heights/Ash-Co-East
Eutaw Pl
Bolton Hill
Rosemont
CSX
Sandtown-Winchester
Mid-Town Belvedere
St Paul St
Johnston Square
Bridgeview/ Greenlawn
Winchester
Howard St Tunnel
CSX
South Ventilation Facility
N Monroe St
N Fulton Ave
W Lafayette Ave
Pennsylvania Ave
Upton
83
Mosher
Evergreen Lawn
Martin Luther King Jr. Blvd
Mount Vernon
Harlem Park
Seton Hill
Edmondson Ave
W Franklin St
40
W Mulberry St
West Baltimore MARC
Amtrak Gwynns Falls Bridge
Amtrak Northeast Corridor
Franklin Square
Poppleton
Downtown
Shipley Hill
Carroll-South Hilton
Millhill
Preferred
Existing B&P Tunnel
Parks
Light Rail Station
Metro Station
North Ventilation Facility
South Ventilation Facility
Intermediate Ventilation Facility
Metro Line
Light Rail Line
Railroad
Interstate
B & P Tunnel Openings
B&P Tunnel Project
Programmatic Agreement
Attachment 1:
Project Location Map
NORTH
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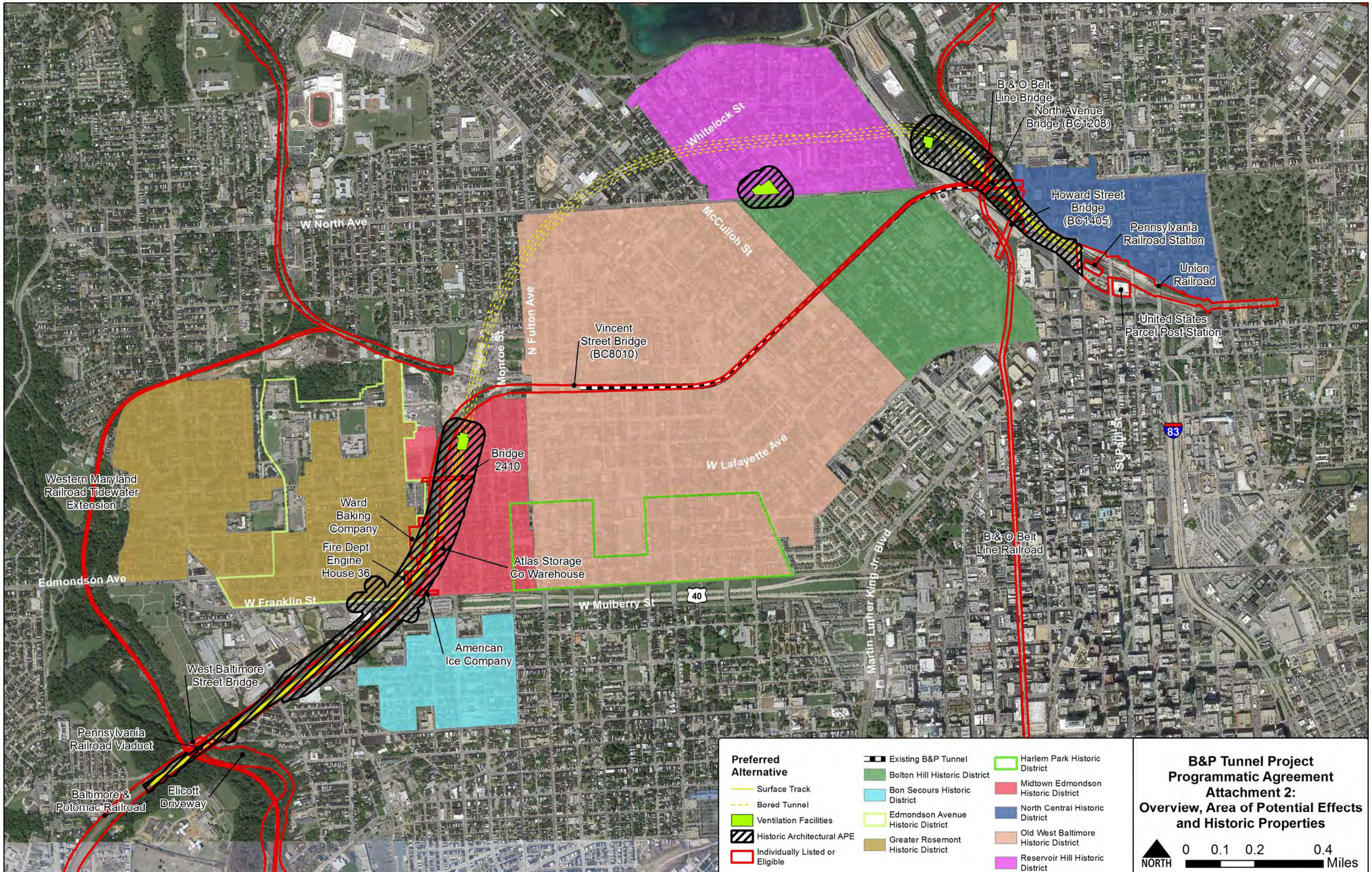
Feet


B & O Belt Line Bridge
North Avenue Bridge (BC1208)
Whitelock St
Howard Street Bridge (BC1405)
Pennsylvania Railroad Station
Union Railroad
United States Parcel Post Station
W North Ave
McCulloh St
N Fulton Ave
Monroe St
Vincent Street Bridge (BC8010)
Bridge 2410
W Lafayette Ave
Western Maryland Railroad Tidewater Extension
Ward Baking Company
Fire Dept Engine House 36
Atlas Storage Co Warehouse
Edmondson Ave
W Franklin St
W Mulberry St
40
American Ice Company
West Baltimore Street Bridge
Martin Luther King Jr. Blvd
B & O Belt Line Railroad
St Paul St
83
Pennsylvania Railroad Viaduct
Baltimore & Potomac Railroad
Elicott Driveway
Preferred Alternative
Surface Track
Bored Tunnel
Ventilation Facilities
Historic Architectural APE
Individually Listed or Eligible
Existing B&P Tunnel
Bolton Hill Historic District
Bon Secours Historic District
Edmondson Avenue Historic District
Greater Rosemont Historic District
Harlem Park Historic District
Midtown Edmondson Historic District
North Central Historic District
Old West Baltimore Historic District
Reservoir Hill Historic District
B&P Tunnel Project
Programmatic Agreement
Attachment 2:
Overview, Area of Potential Effects and Historic Properties
NORTH
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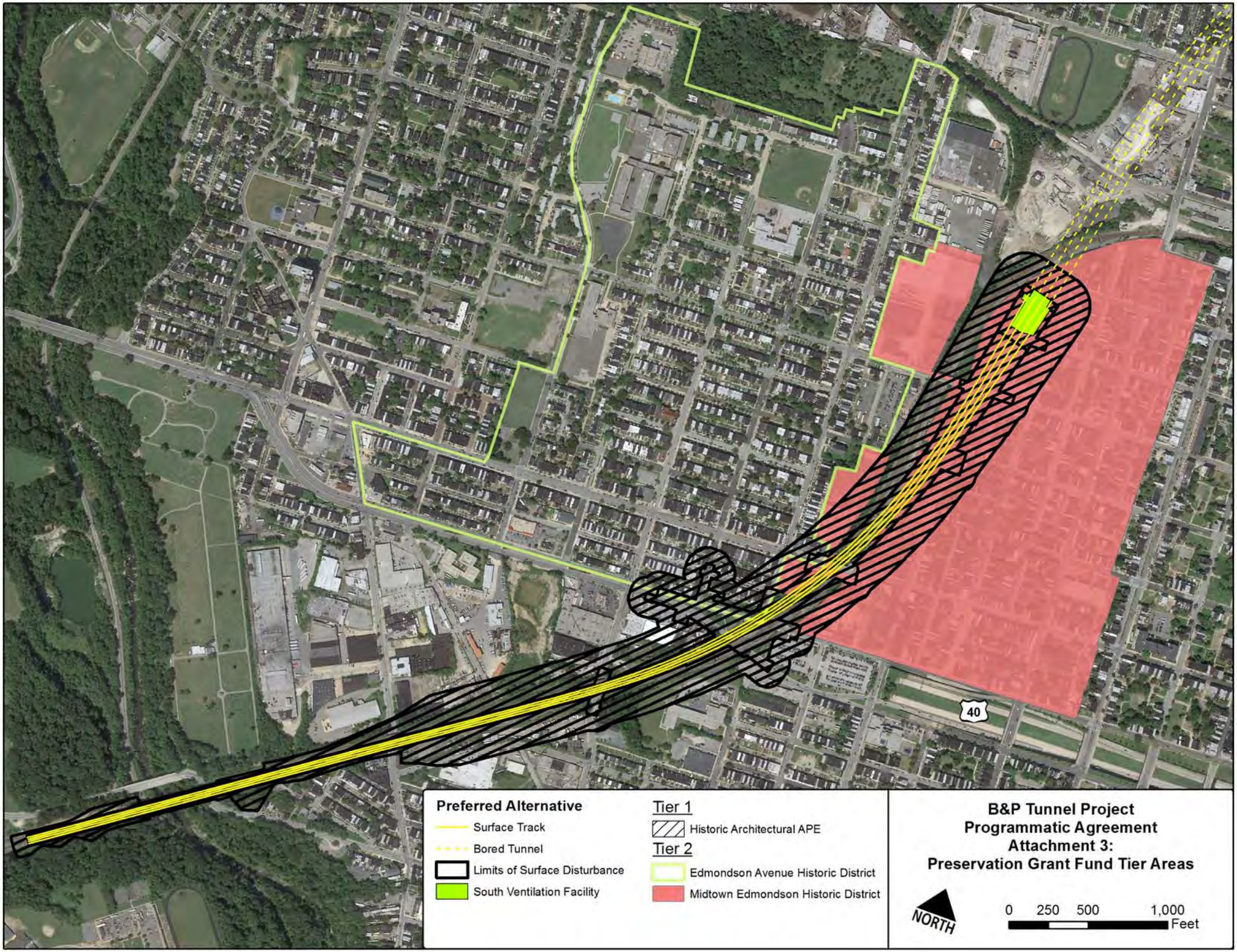
Miles


Preferred Alternative
Surface Track
Bored Tunnel
Limits of Surface Disturbance
South Ventilation Facility
Tier 1
Historic Architectural APE
Tier 2
Edmondson Avenue Historic District
Midtown Edmondson Historic District
B&P Tunnel Project
Programmatic Agreement
Attachment 3:
Preservation Grant Fund Tier Areas
NORTH
0 250 500 1,000
Feet
40

Attachment 4: List of Prior Technical Studies

Dovetail Cultural Resource Group and Rummel, Klepper & Kahl, LLP

2015 *Architectural Historic Properties Survey*, B&P Tunnel Project, Baltimore, Maryland, October 2015. Prepared for the Federal Railroad Administration. On file, Maryland Historical Trust, Crownsville, Maryland.

2015 Christeen Taniguchi, Project Architectural Historian to Elizabeth Hughes, Acting State Historic Preservation Officer, Addendum, Architectural Historic Properties Survey, Twelve Maryland Historical Trust Determination of Eligibility Forms, Baltimore & Potomac Tunnel Project, September 11, 2015. On file, Maryland Historical Trust, Crownsville, Maryland.

Johnsen, Michael

2016 Michael Johnsen, Lead Environmental Protection Specialist to Elizabeth Hughes, State Historic Preservation Officer, Baltimore and Potomac Railroad Technical Memorandum, Section 106 Update, July 28, 2016. On file, Maryland Historical Trust, Crownsville, Maryland.

Rummel, Klepper & Kahl, LLP

2015 *Phase IA Archeological Survey*, B&P Tunnel Project, Baltimore, Maryland, October 2015. Prepared for the Federal Railroad Administration. On file, Maryland Historical Trust, Crownsville, Maryland.

2015 *Architectural Historic Properties Effects Assessment Report*, B&P Tunnel Project, Baltimore, Maryland, October 2015. Prepared for the Federal Railroad Administration. On file, Maryland Historical Trust, Crownsville, Maryland.

Attachment 5: List of Contacts

Signatories

Marlys Osterhues
Division Chief, Environmental and Corridor Planning Division
Federal Railroad Administration
1200 New Jersey Avenue SE
West Building, Mail Stop 20
Washington, DC 20590
202-493-0413
Marlys.Osterhues@dot.gov

Elizabeth Hughes
State Historic Preservation Officer
Maryland Historical Trust
100 Community Place, 3rd floor
Crownsville, MD 21032
410-697-9556
Elizabeth.Hughes@maryland.gov

Invited Signatories

Charles W. Moorman
President and Chief Executive Officer
National Railroad Passenger Corporation
Attn: Rodrigo Bitar
Senior Vice President & Chief Engineer
2955 Market Street
Engineering 4S-014
Philadelphia, PA 19104
215-349-2900
Rodrigo.Bitar@amtrak.com

Nicholas A. Redding
Executive Director
Preservation Maryland
3600 Clipper Mill Road, Suite 248
Baltimore, MD 21211
410-685-2886
NRedding@presmd.org

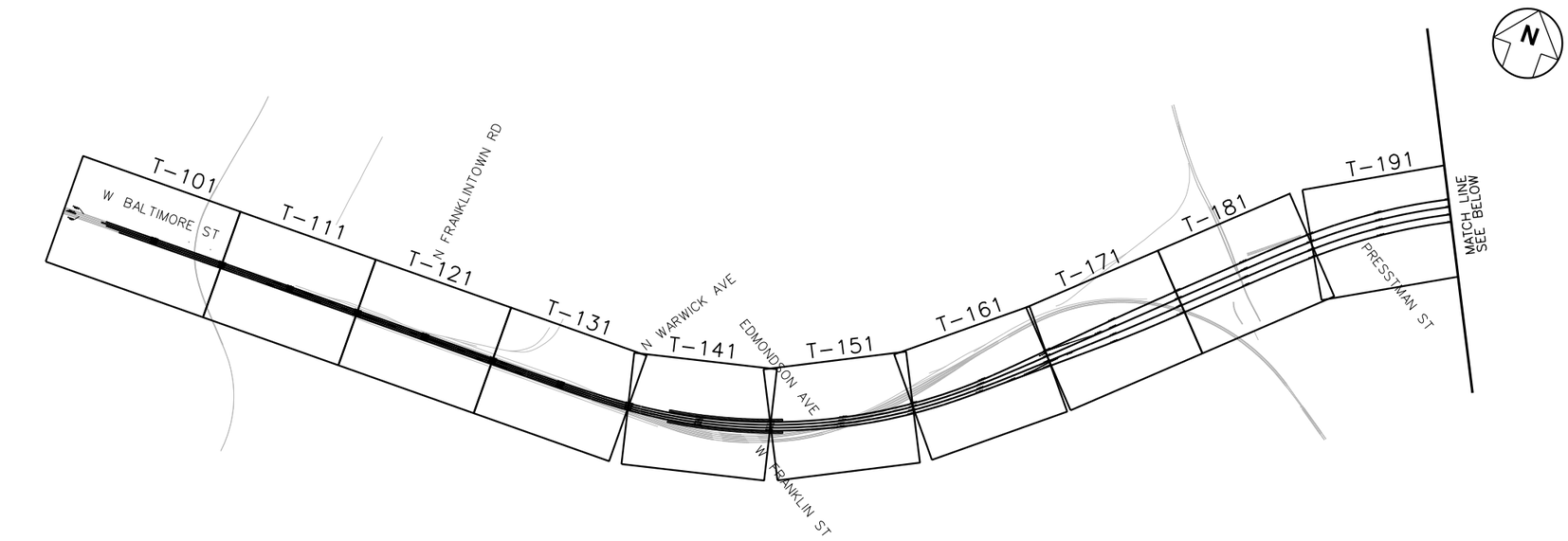
Appendix C

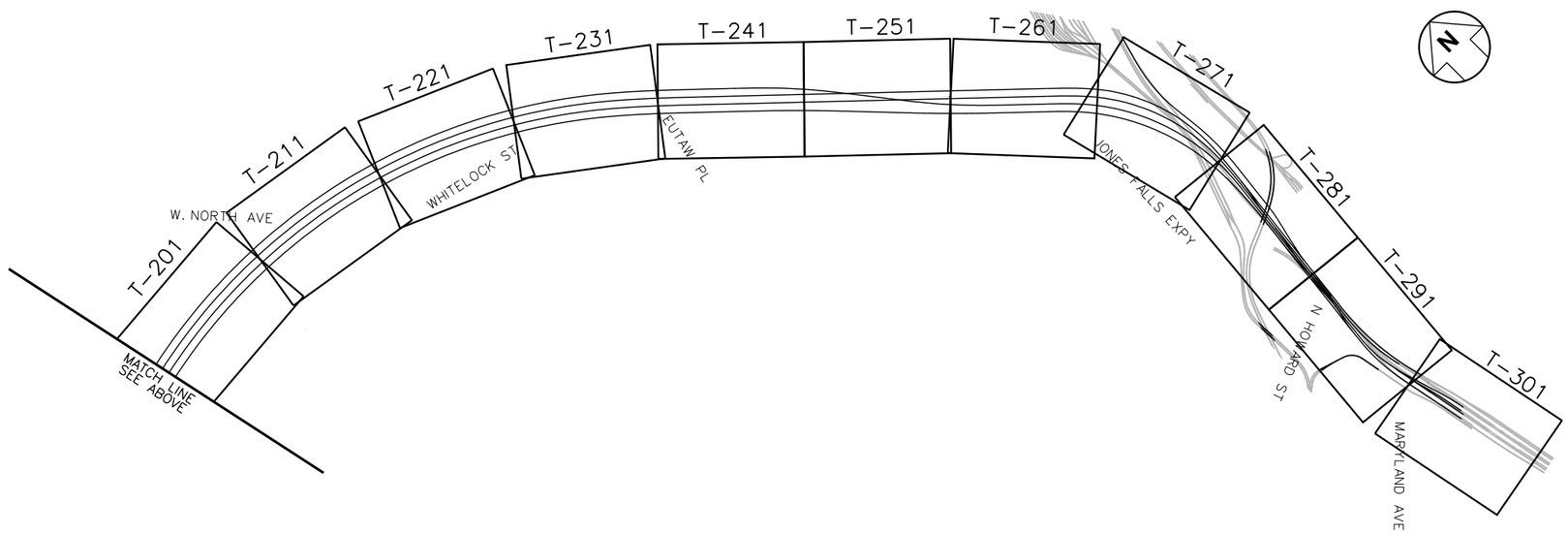
B&P TUNNEL PROJECT

Plan and Profile Drawings

U.S. Department of Transportation
Federal Railroad Administration

Maryland Department
of Transportation





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No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved | Date

WORK IN PROGRESS

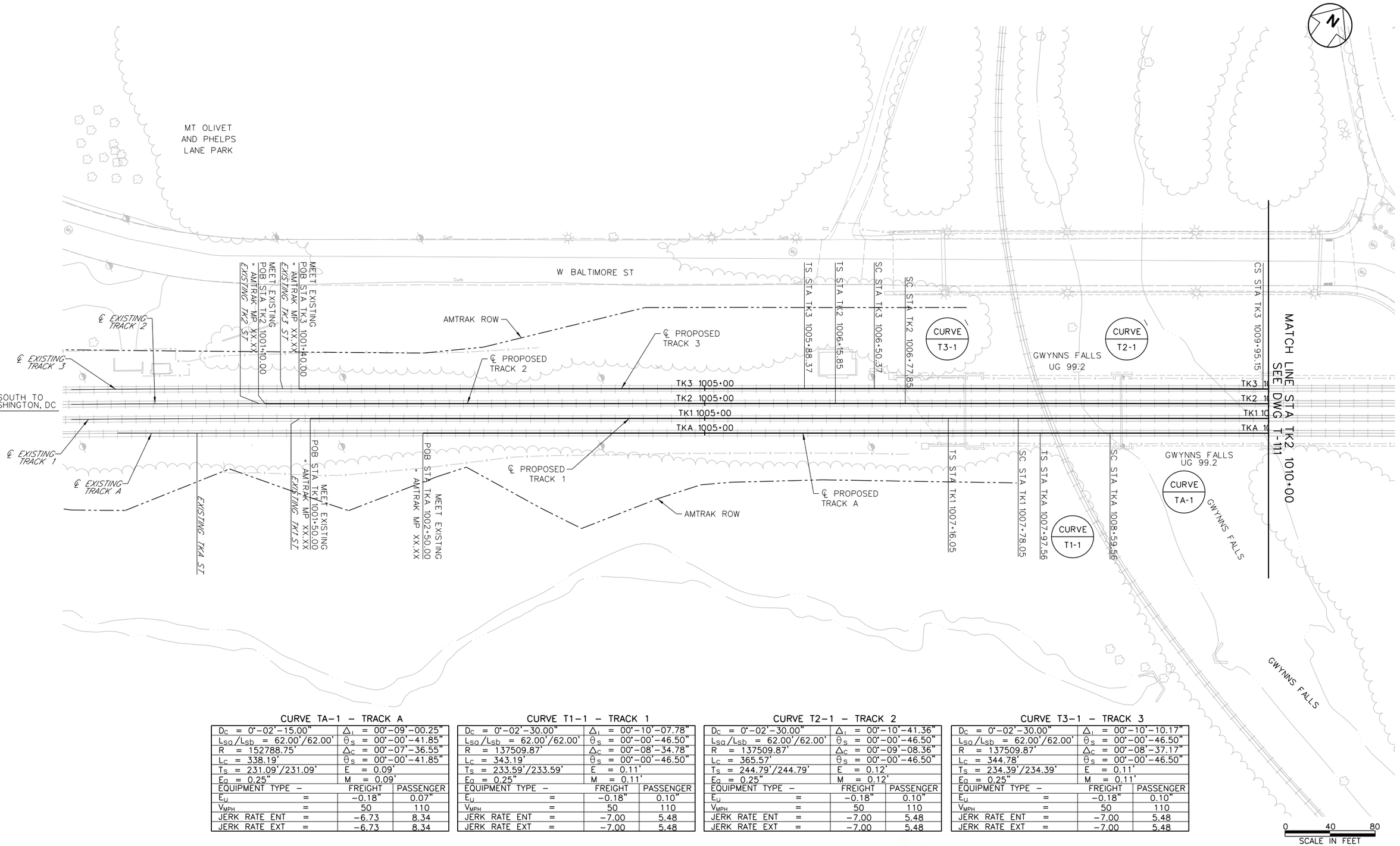
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

KEY MAP

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-051



CURVE TA–1 – TRACK A

D_C = 0°–02'–15.00"	Δ_I = 00°–09'–00.25"		
L_{SC}/L_{SD} = 62.00'/62.00'	θ_S = 00°–00'–41.85"		
R = 152788.75'	Δ_C = 00°–07'–36.55"		
L_C = 338.19'	θ_S = 00°–00'–41.85"		
T_S = 231.09'/231.09'	E = 0.09'		
E_Q = 0.25"	M = 0.09'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	–0.18"	0.07"
V_{MPH}	=	50	110
JERK RATE ENT	=	–6.73	8.34
JERK RATE EXT	=	–6.73	8.34

CURVE T1–1 – TRACK 1

D_C = 0°–02'–30.00"	Δ_I = 00°–10'–07.78"		
L_{SC}/L_{SD} = 62.00'/62.00'	θ_S = 00°–00'–46.50"		
R = 137509.87'	Δ_C = 00°–08'–34.78"		
L_C = 343.19'	θ_S = 00°–00'–46.50"		
T_S = 233.59'/233.59'	E = 0.11'		
E_Q = 0.25"	M = 0.11'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	–0.18"	0.10"
V_{MPH}	=	50	110
JERK RATE ENT	=	–7.00	5.48
JERK RATE EXT	=	–7.00	5.48

CURVE T2–1 – TRACK 2

D_C = 0°–02'–30.00"	Δ_I = 00°–10'–41.36"		
L_{SC}/L_{SD} = 62.00'/62.00'	θ_S = 00°–00'–46.50"		
R = 137509.87'	Δ_C = 00°–09'–08.36"		
L_C = 365.57'	θ_S = 00°–00'–46.50"		
T_S = 244.79'/244.79'	E = 0.12'		
E_Q = 0.25"	M = 0.12'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	–0.18"	0.10"
V_{MPH}	=	50	110
JERK RATE ENT	=	–7.00	5.48
JERK RATE EXT	=	–7.00	5.48

CURVE T3–1 – TRACK 3

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R = 137509.87'	Δ_C = 00°–08'–37.17"		
L_C = 344.78'	θ_S = 00°–00'–46.50"		
T_S = 234.39'/234.39'	E = 0.11'		
E_Q = 0.25"	M = 0.11'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	–0.18"	0.10"
V_{MPH}	=	50	110
JERK RATE ENT	=	–7.00	5.48
JERK RATE EXT	=	–7.00	5.48

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved Date

WORK IN PROGRESS

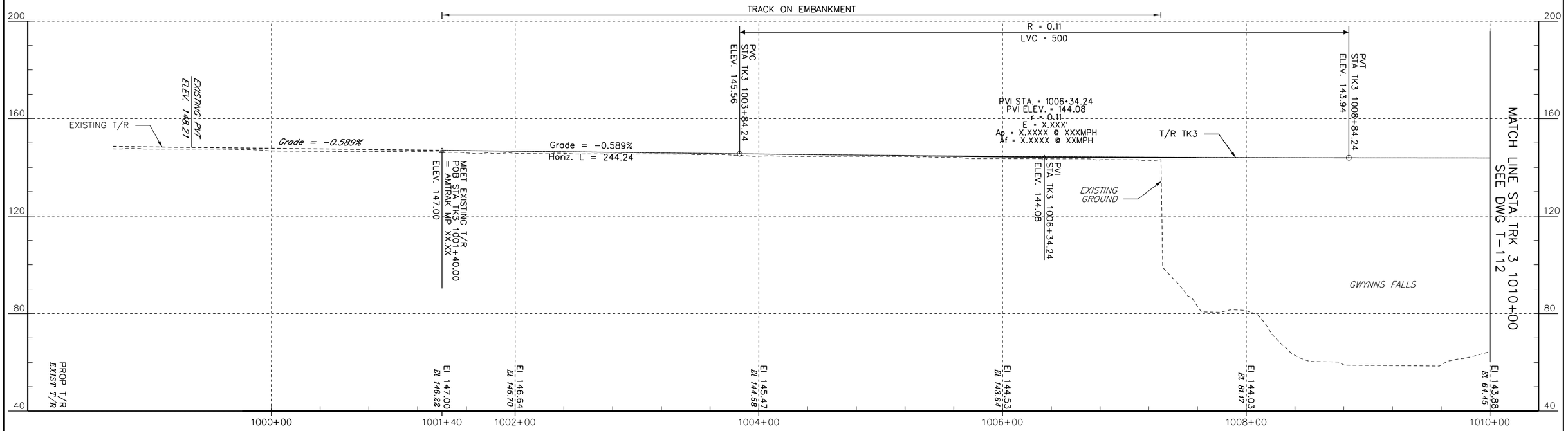
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

TRACK PLAN
STA TK2 1001+10 TO STA TK2 1010+00

Designed DO | Drawn JB | Checked FB | Date 09/28/2016

Project No: C.EN.201278
File name. No: XXXXX
Sheet No. OF XX
Dwg. No. T–101



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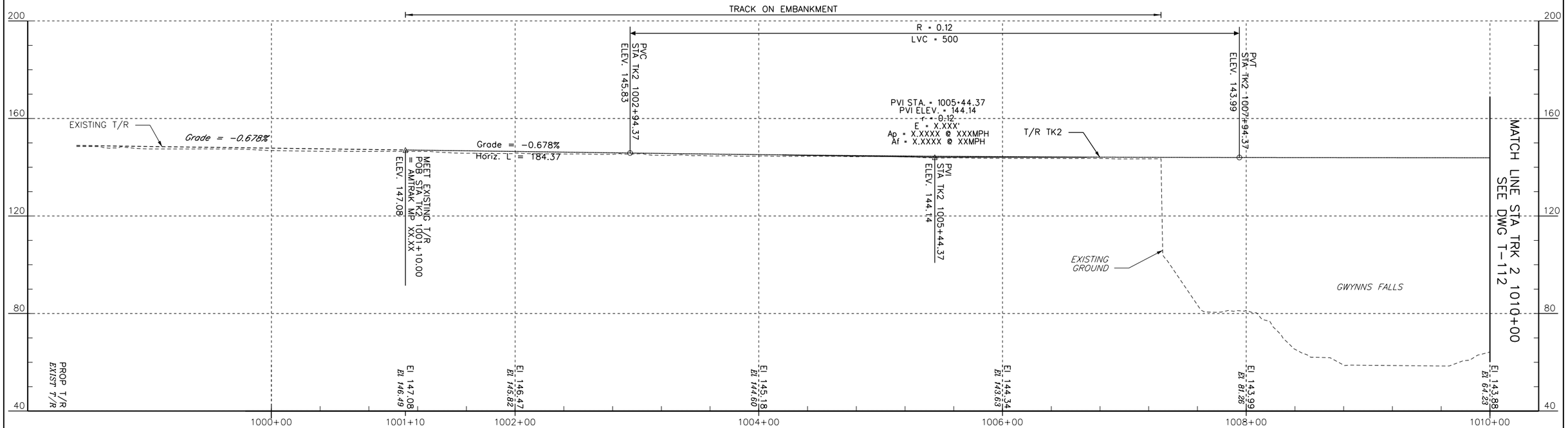

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No.	Revisions	Date	By

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STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved | Date

WORK IN PROGRESS

A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

PROFILES – TRACK 2 & TRACK 3
STA. 1000+00 TO STA. 1010+00

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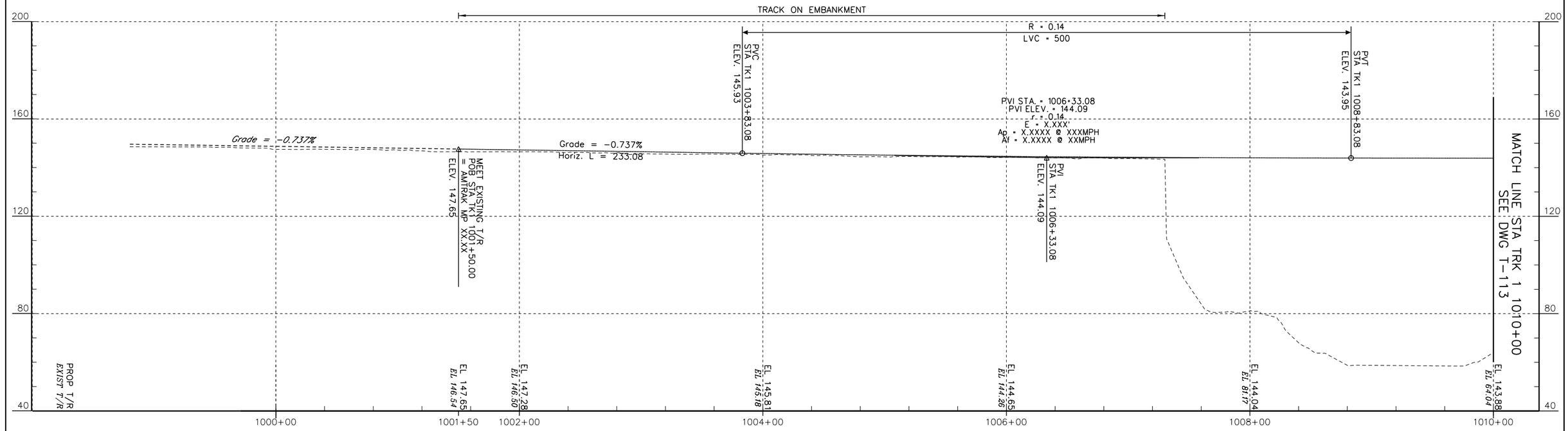

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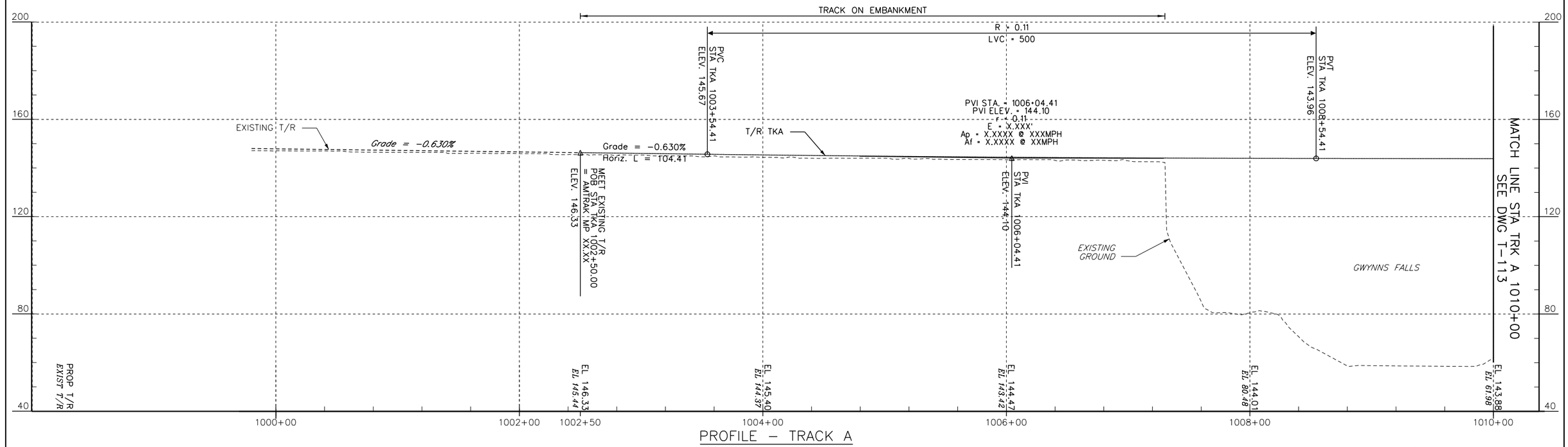

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$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

No.	Revisions	Date	By

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

PROFILES – TRACK A & TRACK 1
STA. 1000+00 TO STA. 1010+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

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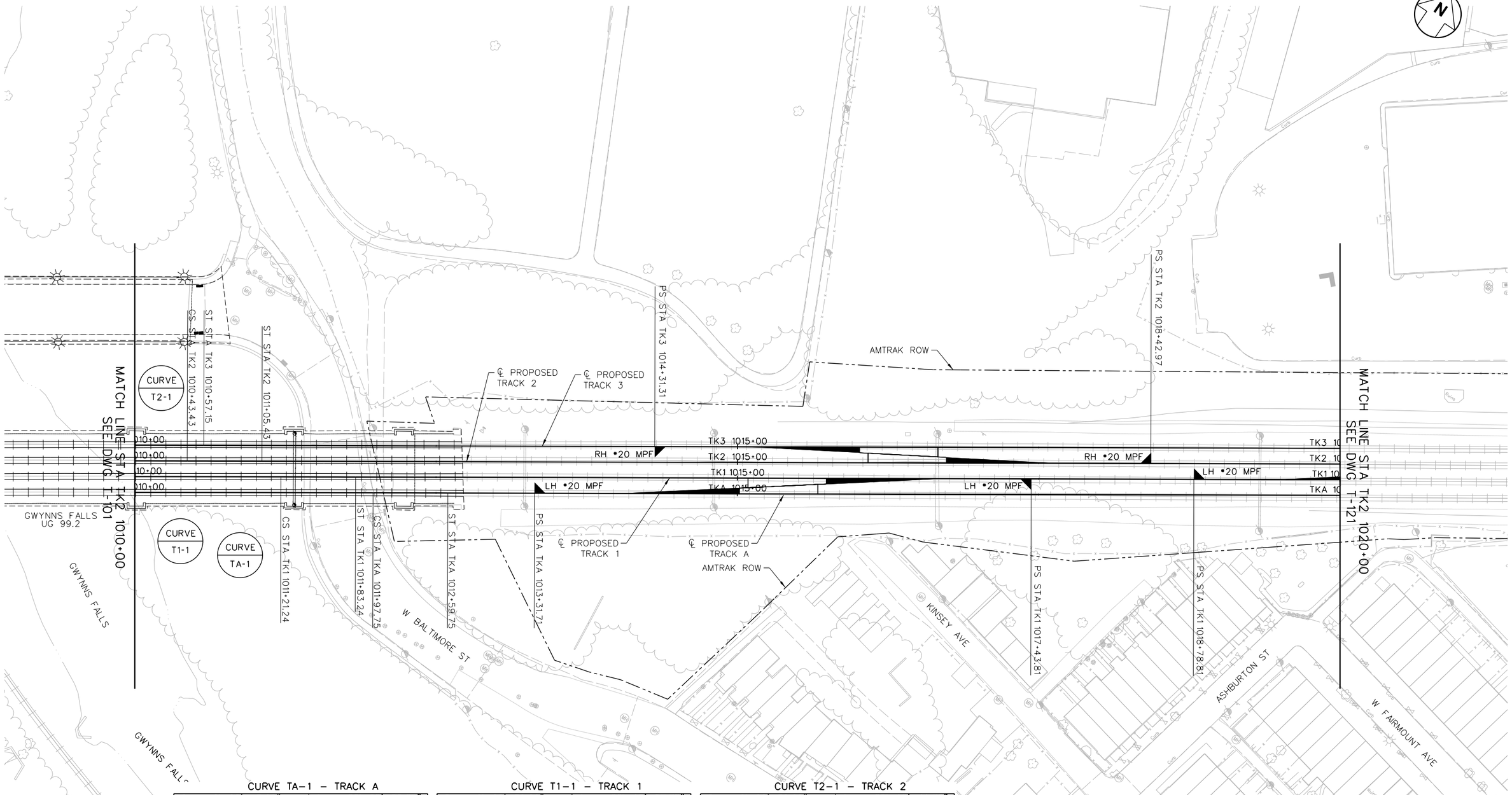

CURVE TA-1 – TRACK A

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L_{SC}/L_{SB} = 62.00'/62.00'		θ_S = 00°-00'-41.85"	
R = 152788.75'		Δ_C = 00°-07'-36.55"	
L_C = 338.19'		θ_S = 00°-00'-41.85"	
T_S = 231.09'/231.09'		E = 0.09'	
E_Q = 0.25"		M = 0.09'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-0.18"	0.07"
V_{MPH}	=	50	110
JERK RATE ENT	=	-6.73	8.34
JERK RATE EXT	=	-6.73	8.34

CURVE T1-1 – TRACK 1

D_C = 0°-02'-30.00"		Δ_I = 00°-10'-07.78"	
L_{SC}/L_{SB} = 62.00'/62.00'		θ_S = 00°-00'-46.50"	
R = 137509.87'		Δ_C = 00°-08'-34.78"	
L_C = 343.19'		θ_S = 00°-00'-46.50"	
T_S = 233.59'/233.59'		E = 0.11'	
E_Q = 0.25"		M = 0.11'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-0.18"	0.10"
V_{MPH}	=	50	110
JERK RATE ENT	=	-7.00	5.48
JERK RATE EXT	=	-7.00	5.48

CURVE T2-1 – TRACK 2

D_C = 0°-02'-30.00"		Δ_I = 00°-10'-41.36"	
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R = 137509.87'		Δ_C = 00°-09'-08.36"	
L_C = 365.57'		θ_S = 00°-00'-46.50"	
T_S = 244.79'/244.79'		E = 0.12'	
E_Q = 0.25"		M = 0.12'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-0.18"	0.10"
V_{MPH}	=	50	110
JERK RATE ENT	=	-7.00	5.48
JERK RATE EXT	=	-7.00	5.48

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

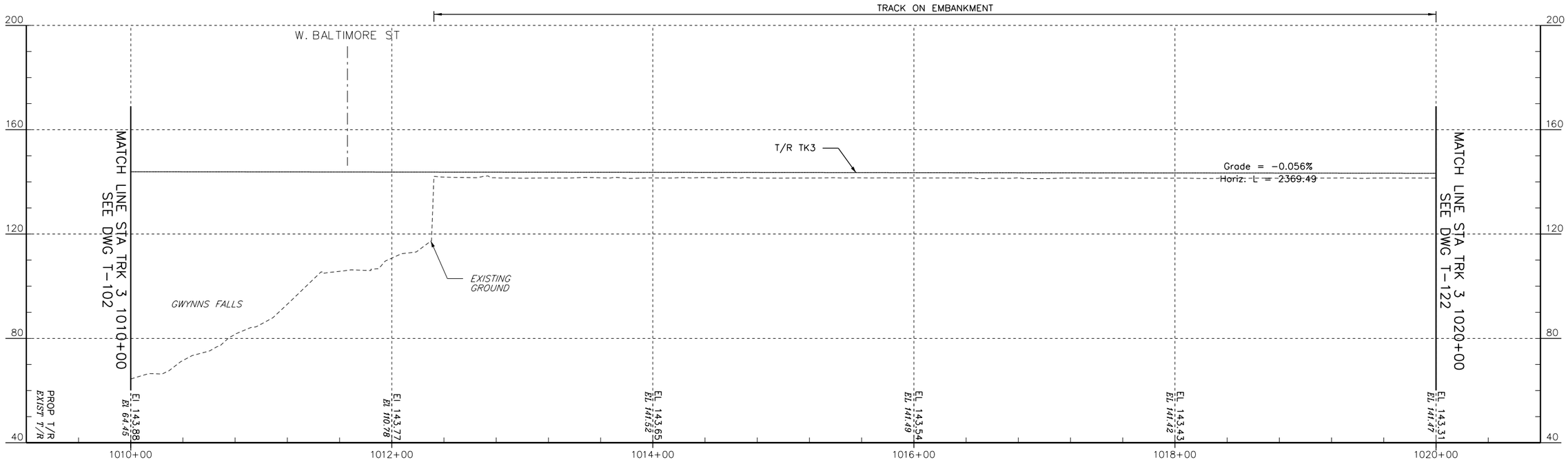
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

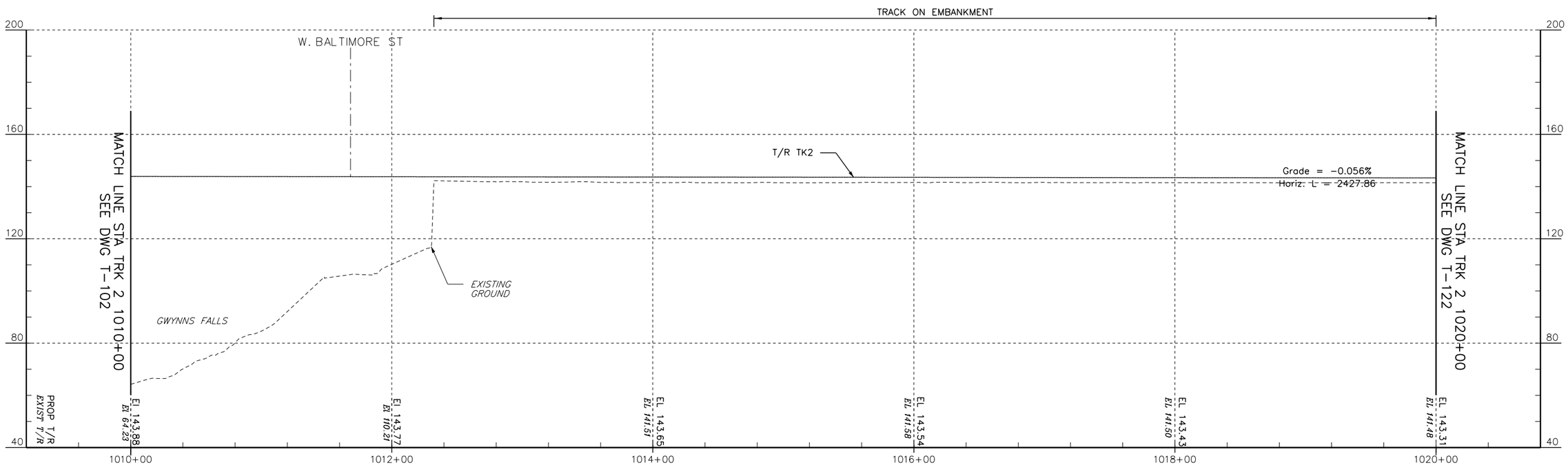
TRACK PLAN
STA TK2 1010+00 TO STA TK2 1020+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-111



PROFILE – TRACK 3



PROFILE – TRACK 2

HORIZ. SCALE IN FEET 0 40 80

VERT. SCALE IN FEET 0 20 40

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

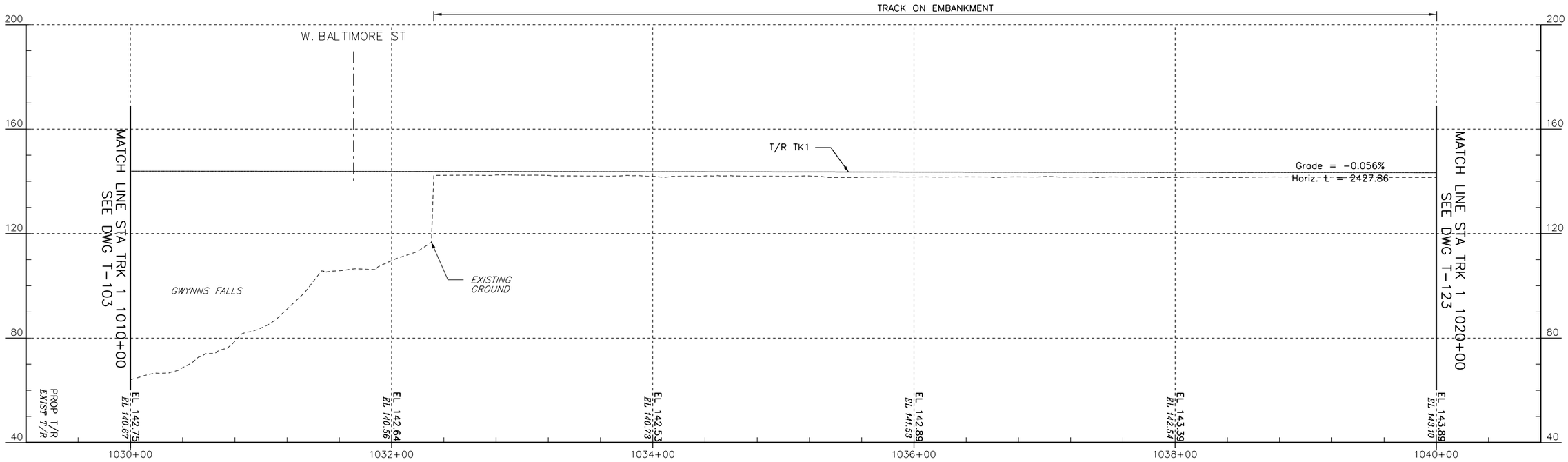
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

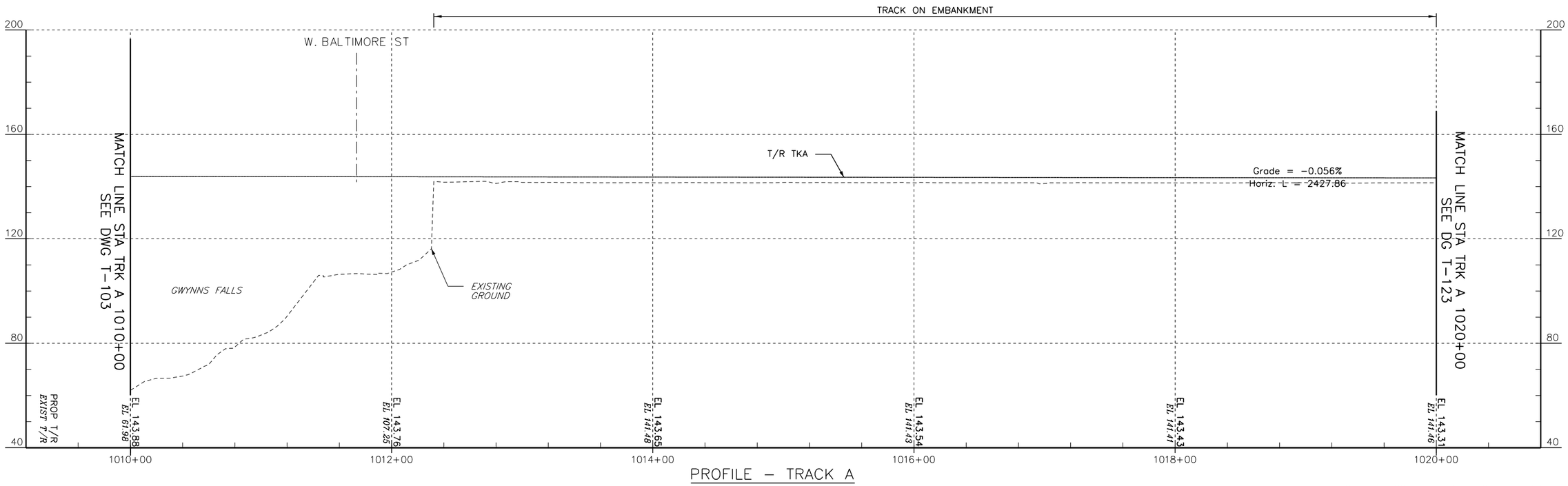
PROFILES – TRACK 2 & TRACK 3
STA. 1010+00 TO STA. 1020+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-112



PROFILE – TRACK 1



PROFILE – TRACK A

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO
$TIME$

AMTRAK

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National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

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A Parsons Brinckerhoff/Parsons Joint Venture

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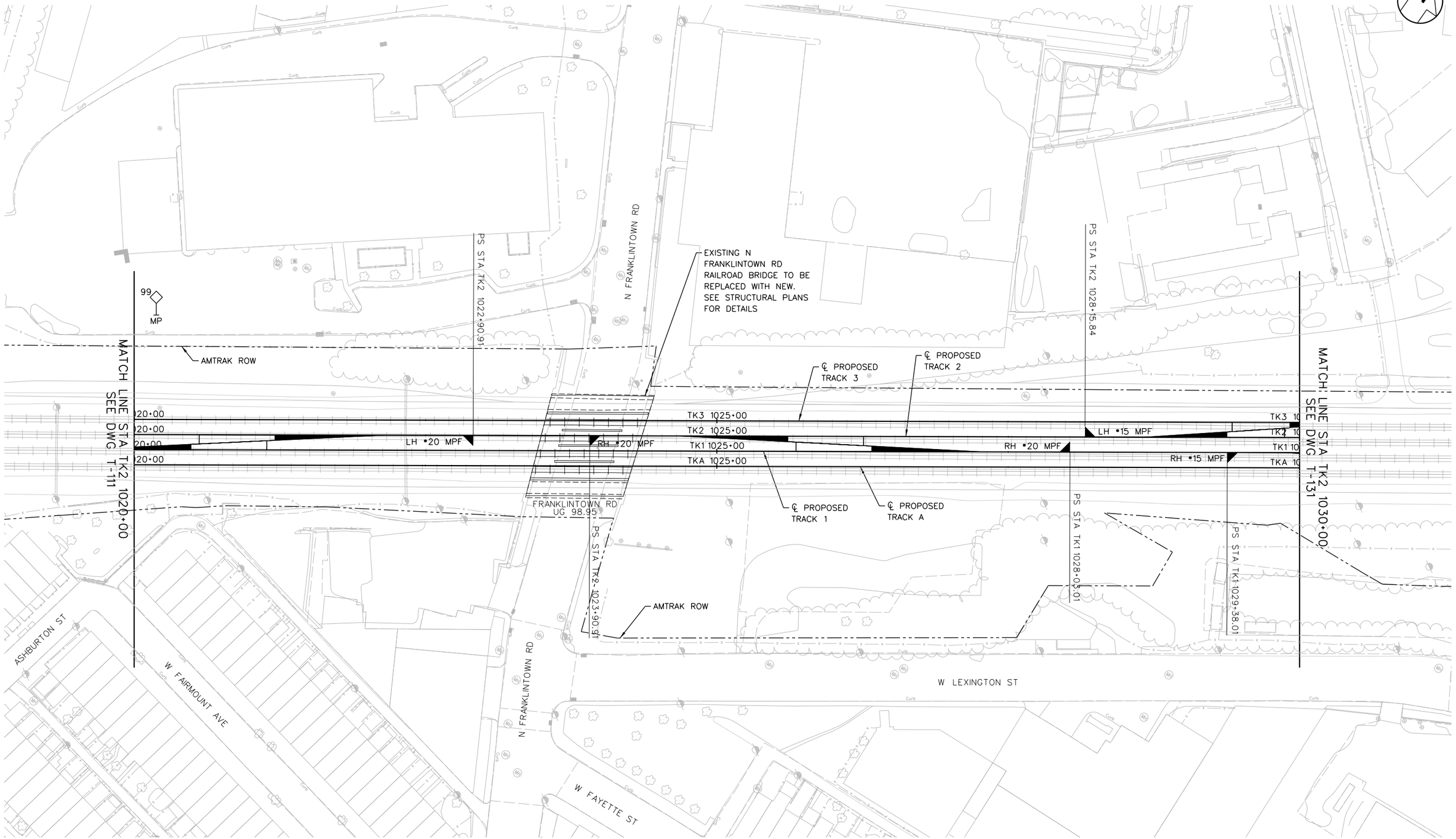
B&P TUNNEL

PROFILES – TRACK A & TRACK 1
STA. 1010+00 TO STA. 1020+00

Designed DO | Drawn JB | Checked FB | Date 09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg No.	T-113



No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

A Parsons Brinckerhoff/Parsons Joint Venture

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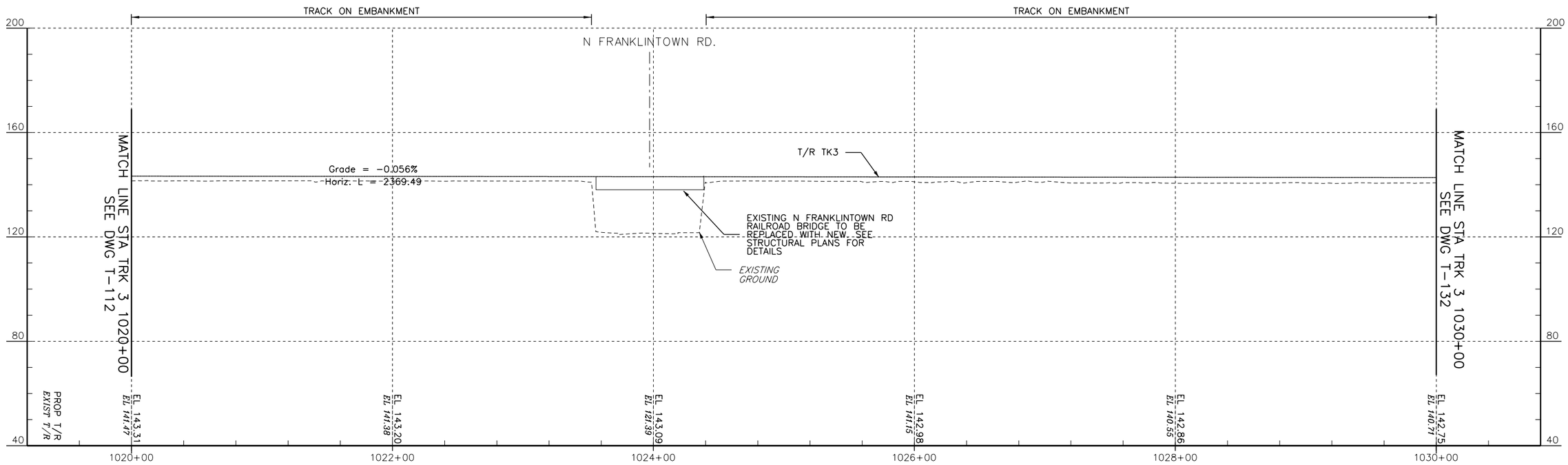
B&P TUNNEL

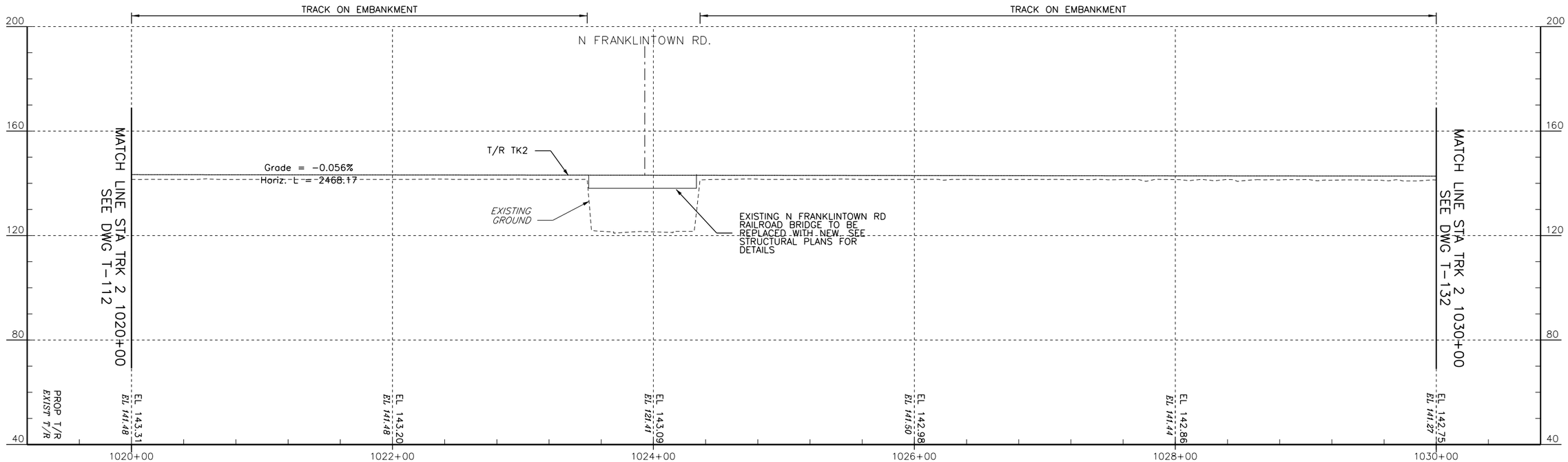
TRACK PLAN
STA TK2 1020+00 TO STA TK2 1030+00

Designed	Drawn	Checked	Date
DO	JB	FB	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-121



PROFILE – TRACK 3



PROFILE – TRACK 2

HORIZ. SCALE IN FEET 0 40 80

VERT. SCALE IN FEET 0 20 40

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

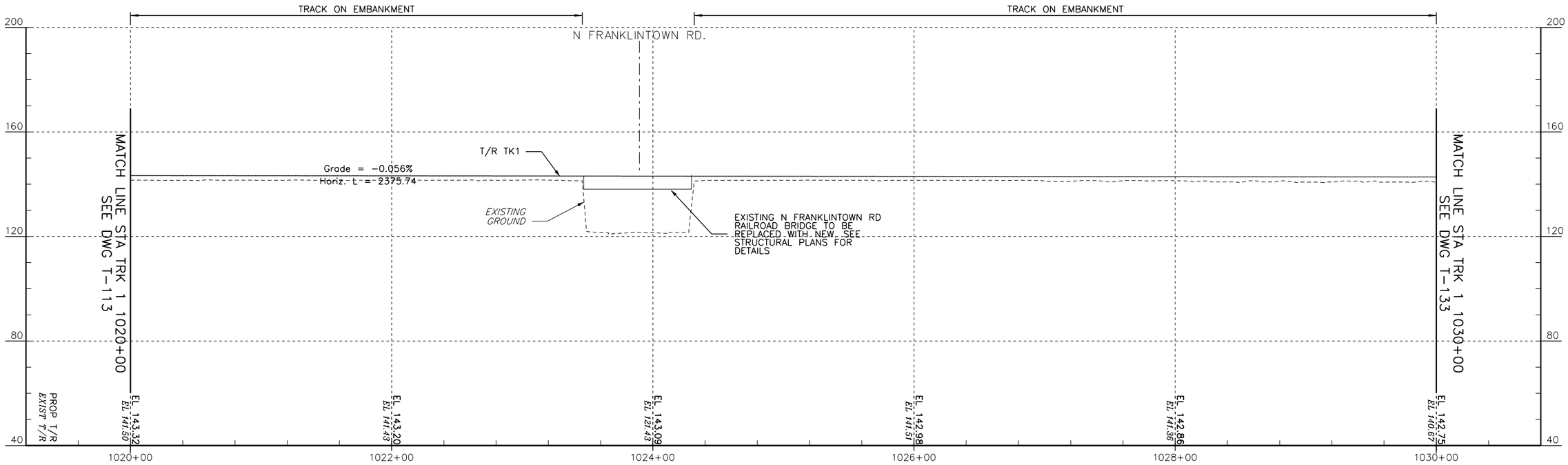
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

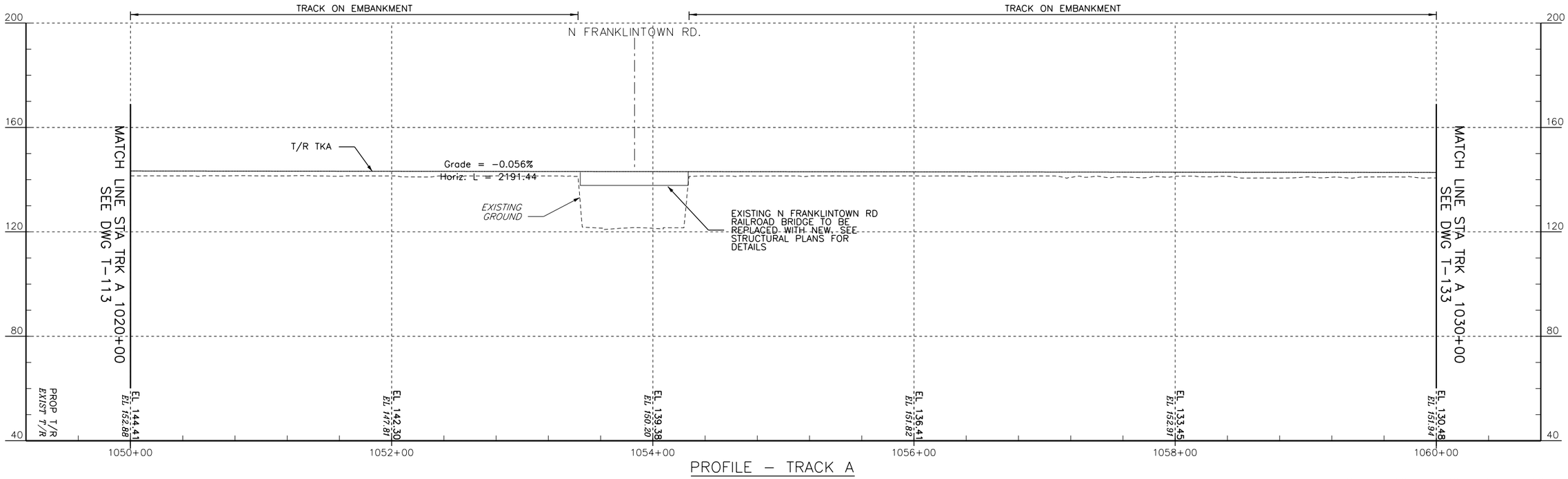
PROFILES – TRACK 2 & TRACK 3
STA. 1020+00 TO STA. 1030+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-122



PROFILE – TRACK 1



PROFILE – TRACK A

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

No.	Revisions	Date	By

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

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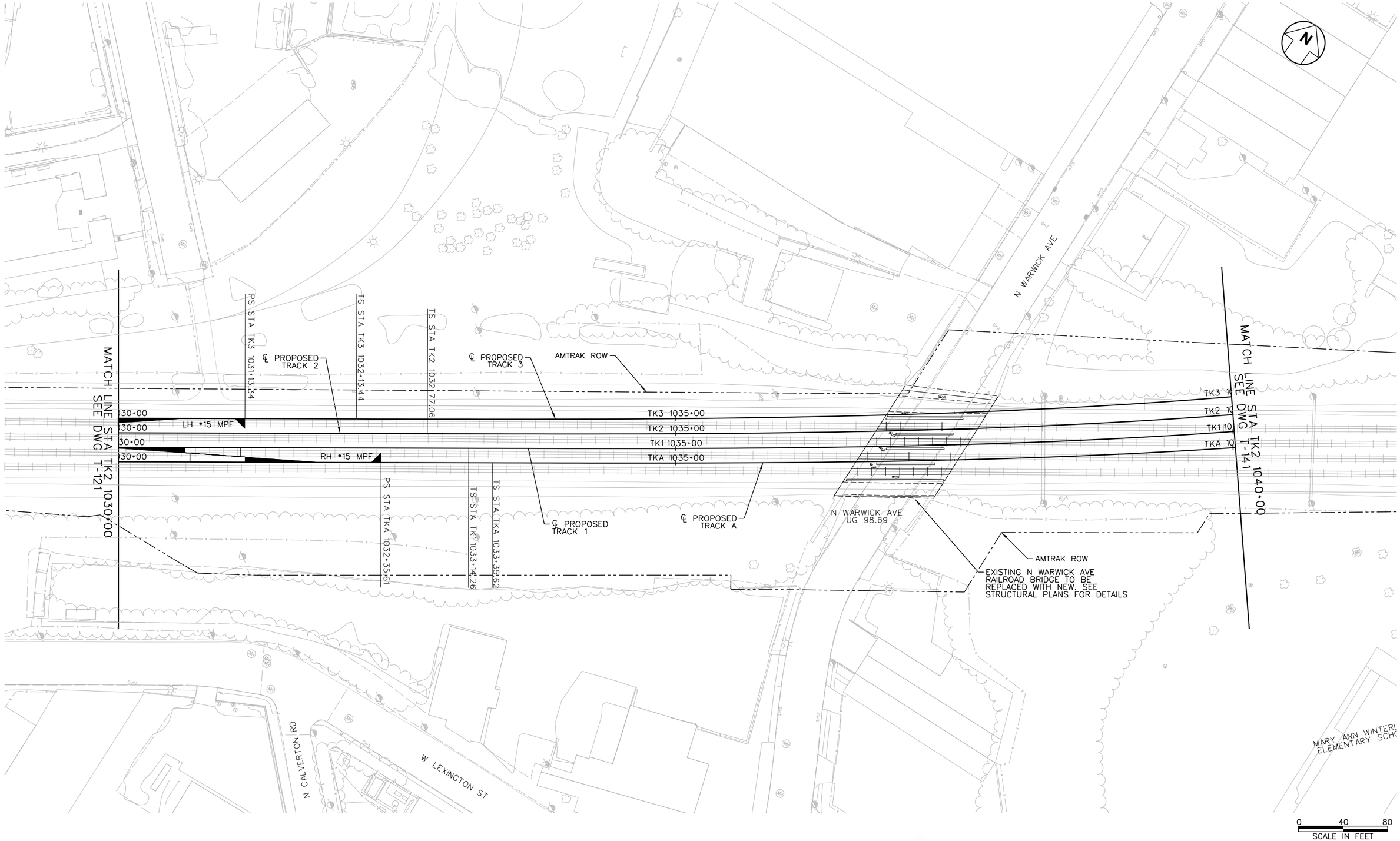
PROFILES – TRACK A & TRACK 1
STA. 1020+00 TO STA. 1030+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg No.	T-123



No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
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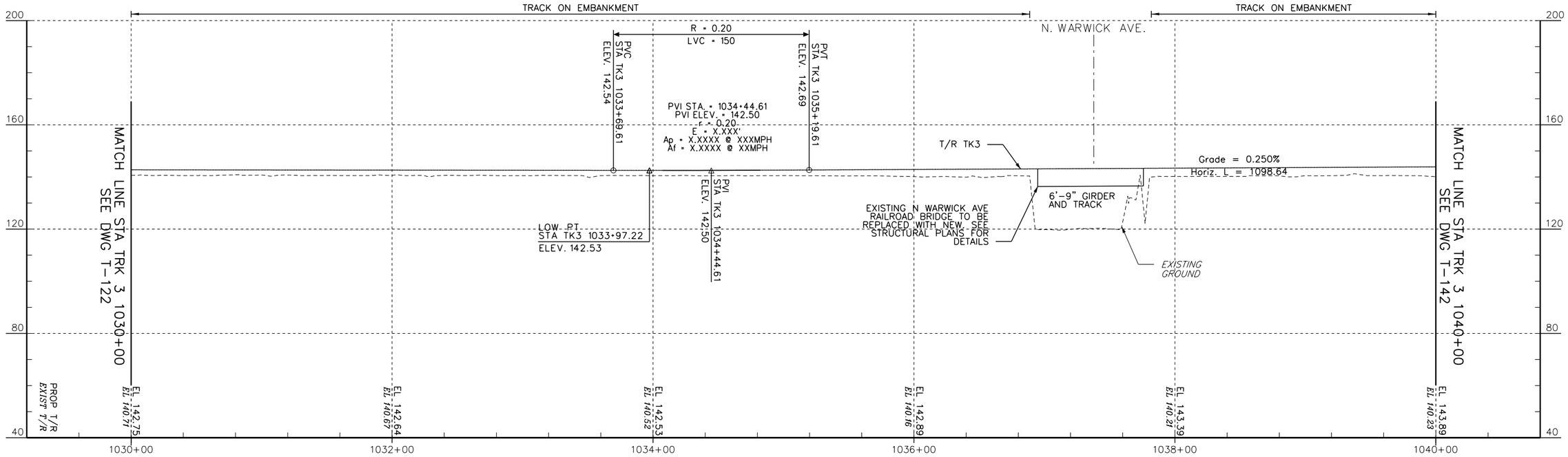
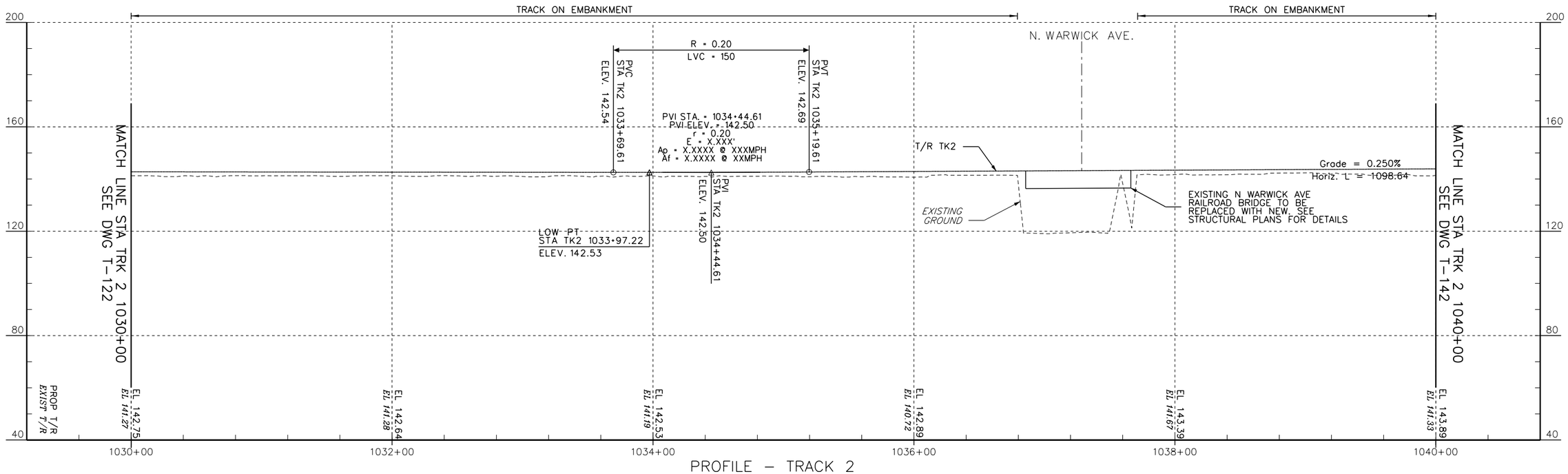
TRACK PLAN
STA TK2 1030+00 TO STA TK2 1040+00

Designed	Drawn	Checked	Date
DO	JB	FB	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-131



PROFILE – TRACK 3



PROFILE – TRACK 2

0 40 80
HORIZ. SCALE IN FEET

0 20 40
VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

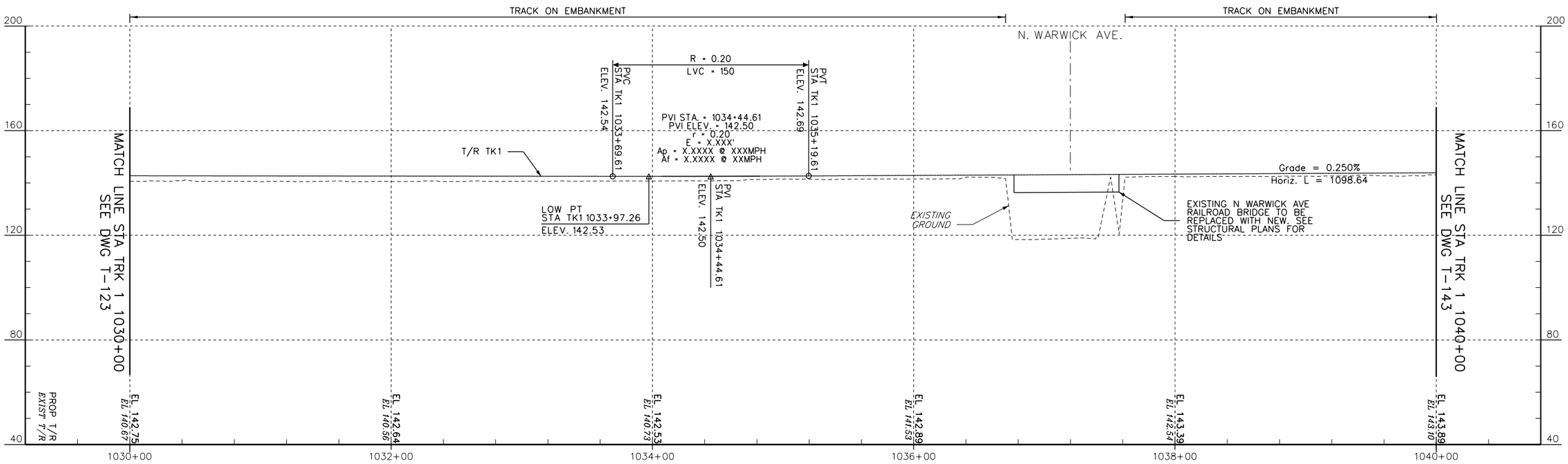
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

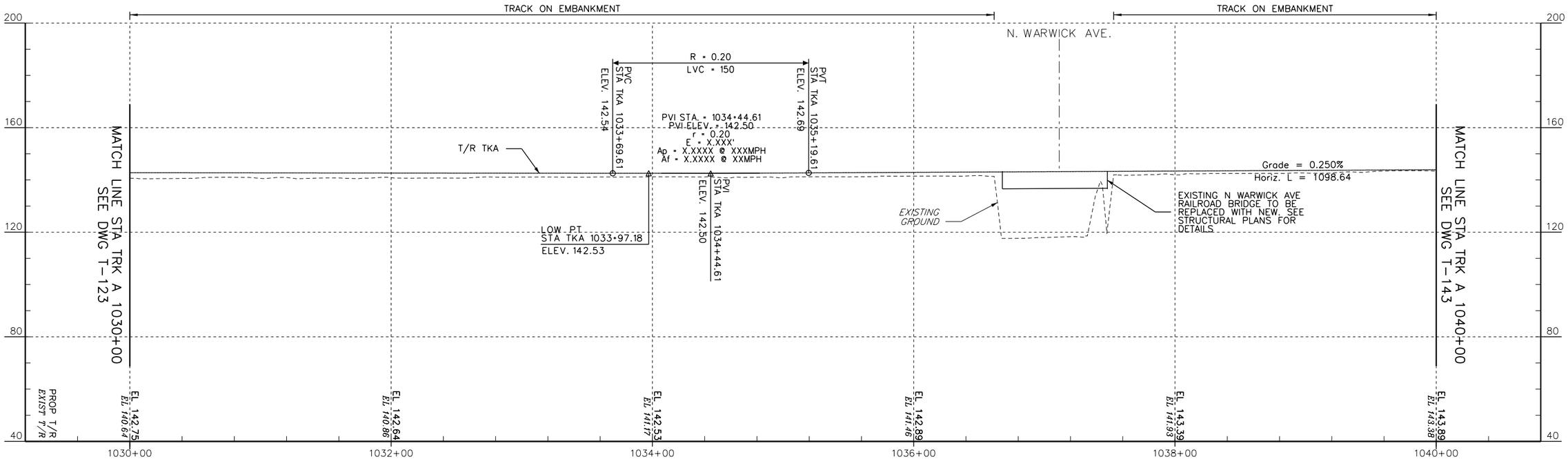
PROFILES – TRACK 2 & TRACK 3
STA. 1030+00 TO STA. 1040+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-132



PROFILE – TRACK 1



PROFILE – TRACK A

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved | Date

WORK IN PROGRESS

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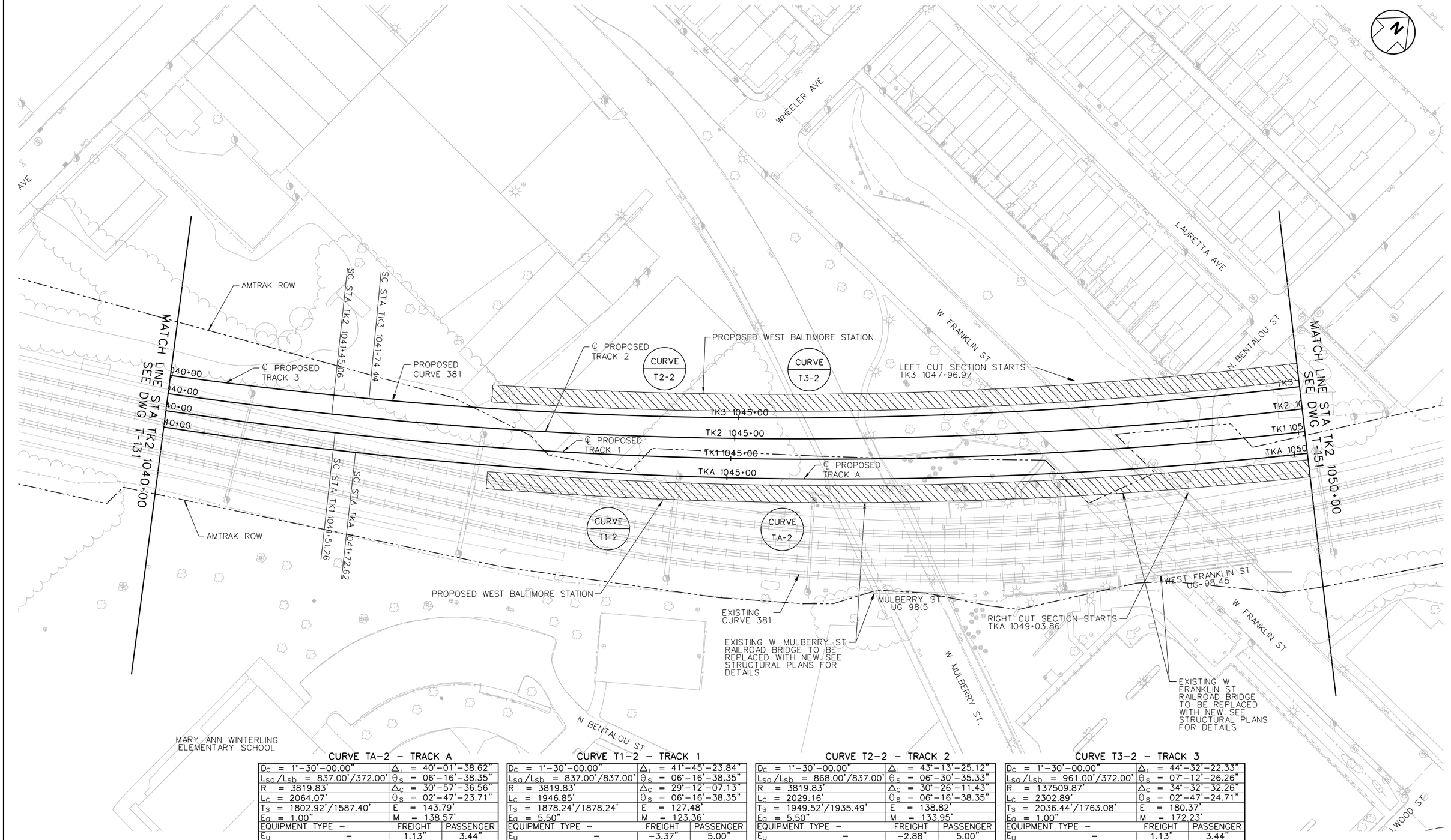
BALTIMORE, MD MPXX
B&P TUNNEL

PROFILES – TRACK A & TRACK 1
STA. 1030+00 TO STA. 1040+00

Designed DO | Drawn JB | Checked FB | Date 09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg No.	T-133


N
WHEELER AVE
LAURETTA AVE
W FRANKLIN ST
N. BENTALOU ST
AMTRAK ROW
SC STA TK2 1041+45.06
SC STA TK3 1041+74.44
PROPOSED CURVE 381
℄ PROPOSED TRACK 2
PROPOSED WEST BALTIMORE STATION
℄ PROPOSED TRACK 3
CURVE T2-2
CURVE T3-2
LEFT CUT SECTION STARTS TK3 1047+96.97
MATCH LINE STA TK2 1040+00 SEE DWG T-131
MATCH LINE STA TK2 1050+00 SEE DWG T-151
TK3 1045+00
TK2 1045+00
TK1 1045+00
TKA 1045+00
℄ PROPOSED TRACK 1
℄ PROPOSED TRACK A
SC STA TK1 1041+51.26
SC STA TKA 1041+72.62
CURVE T1-2
CURVE TA-2
AMTRAK ROW
PROPOSED WEST BALTIMORE STATION
EXISTING CURVE 381
EXISTING W MULBERRY ST RAILROAD BRIDGE TO BE REPLACED WITH NEW. SEE STRUCTURAL PLANS FOR DETAILS
MULBERRY ST UG 98.5
RIGHT CUT SECTION STARTS TKA 1049+03.86
WEST FRANKLIN ST UG-98.45
W FRANKLIN ST
W MULBERRY ST.
EXISTING W FRANKLIN ST RAILROAD BRIDGE TO BE REPLACED WITH NEW. SEE STRUCTURAL PLANS FOR DETAILS
N BENTALOU ST
MARY ANN WINTERLING ELEMENTARY SCHOOL
WOOD ST
0 40 80
SCALE IN FEET

CURVE TA-2 – TRACK A

D_C = 1°-30'-00.00"	Δ_I = 40°-01'-38.62"		
L_{SQ}/L_{SB} = 837.00'/372.00'	θ_S = 06°-16'-38.35"		
R = 3819.83'	Δ_C = 30°-57'-36.56"		
L_C = 2064.07'	θ_S = 02°-47'-23.71"		
T_S = 1802.92'/1587.40'	E = 143.79'		
E_Q = 1.00"	M = 138.57'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	1.13"	3.44"
V_{MPH}	=	45	65
JERK RATE ENT	=	16.52	3.75
JERK RATE EXT	=	7.34	1.67

CURVE T1-2 – TRACK 1

D_C = 1°-30'-00.00"	Δ_I = 41°-45'-23.84"		
L_{SQ}/L_{SB} = 837.00'/837.00'	θ_S = 06°-16'-38.35"		
R = 3819.83'	Δ_C = 29°-12'-07.13"		
L_C = 1946.85'	θ_S = 06°-16'-38.35"		
T_S = 1878.24'/1878.24'	E = 127.48'		
E_Q = 5.50"	M = 123.36'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-3.37"	5.00"
V_{MPH}	=	45	100
JERK RATE ENT	=	-5.51	1.67
JERK RATE EXT	=	-5.51	1.67

CURVE T2-2 – TRACK 2

D_C = 1°-30'-00.00"	Δ_I = 43°-13'-25.12"		
L_{SQ}/L_{SB} = 868.00'/837.00'	θ_S = 06°-30'-35.33"		
R = 3819.83'	Δ_C = 30°-26'-11.43"		
L_C = 2029.16'	θ_S = 06°-16'-38.35"		
T_S = 1949.52'/1935.49'	E = 138.82'		
E_Q = 5.50"	M = 133.95'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-2.88"	5.00"
V_{MPH}	=	50	100
JERK RATE ENT	=	-6.04	1.74
JERK RATE EXT	=	-5.82	1.67

CURVE T3-2 – TRACK 3

D_C = 1°-30'-00.00"	Δ_I = 44°-32'-22.33"		
L_{SQ}/L_{SB} = 961.00'/372.00'	θ_S = 07°-12'-26.26"		
R = 137509.87'	Δ_C = 34°-32'-32.26"		
L_C = 2302.89'	θ_S = 02°-47'-24.71"		
T_S = 2036.44'/1763.08'	E = 180.37'		
E_Q = 1.00"	M = 172.23'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	1.13"	3.44"
V_{MPH}	=	45	65
JERK RATE ENT	=	18.97	4.30
JERK RATE EXT	=	7.34	1.67

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

No.	Revisions	Date	By

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved Date

WORK IN PROGRESS

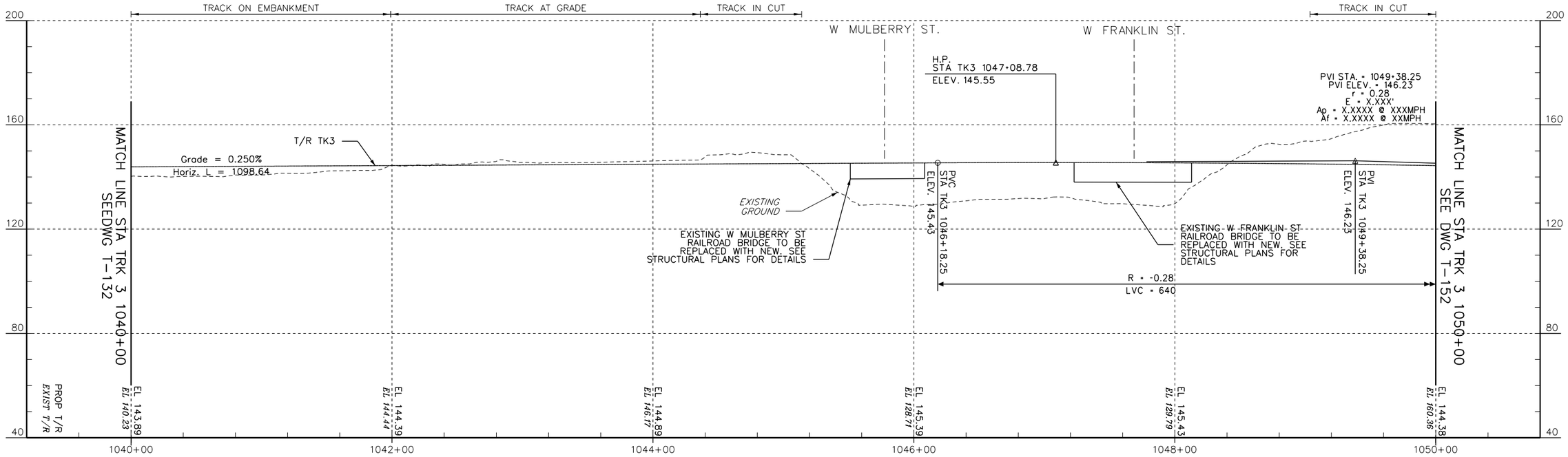
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

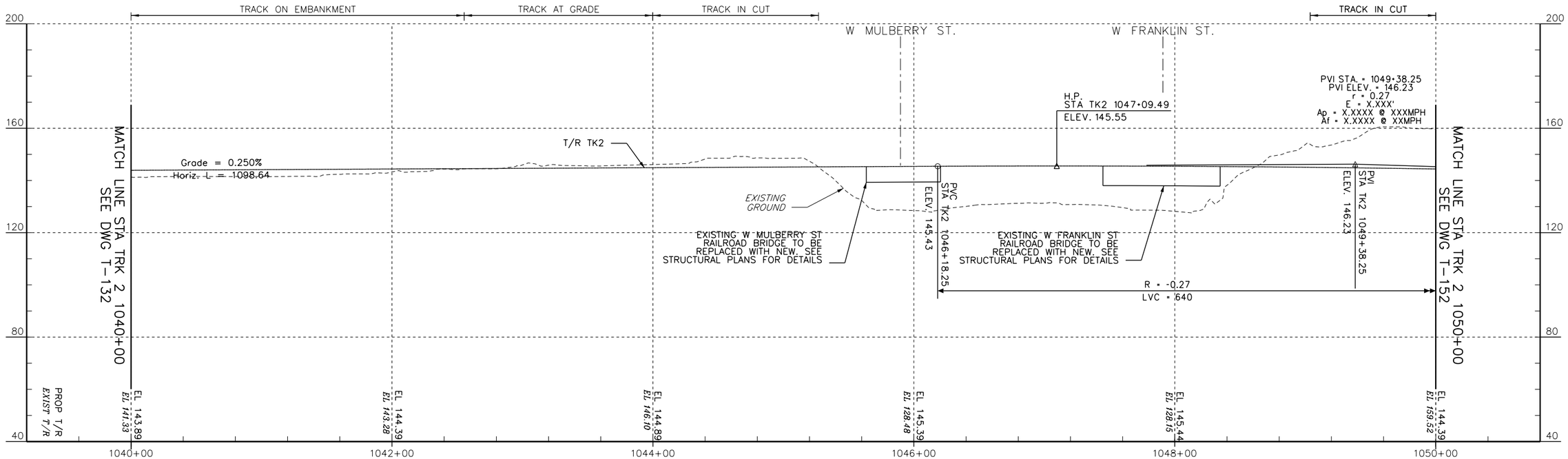
TRACK PLAN
STA TK2 1040+00 TO STA TK2 1050+00

Designed	Drawn	Checked	Date
DO	JB	FB	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-141



PROFILE – TRACK 3



PROFILE – TRACK 2

0 40 80
HORIZ. SCALE IN FEET

0 20 40
VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

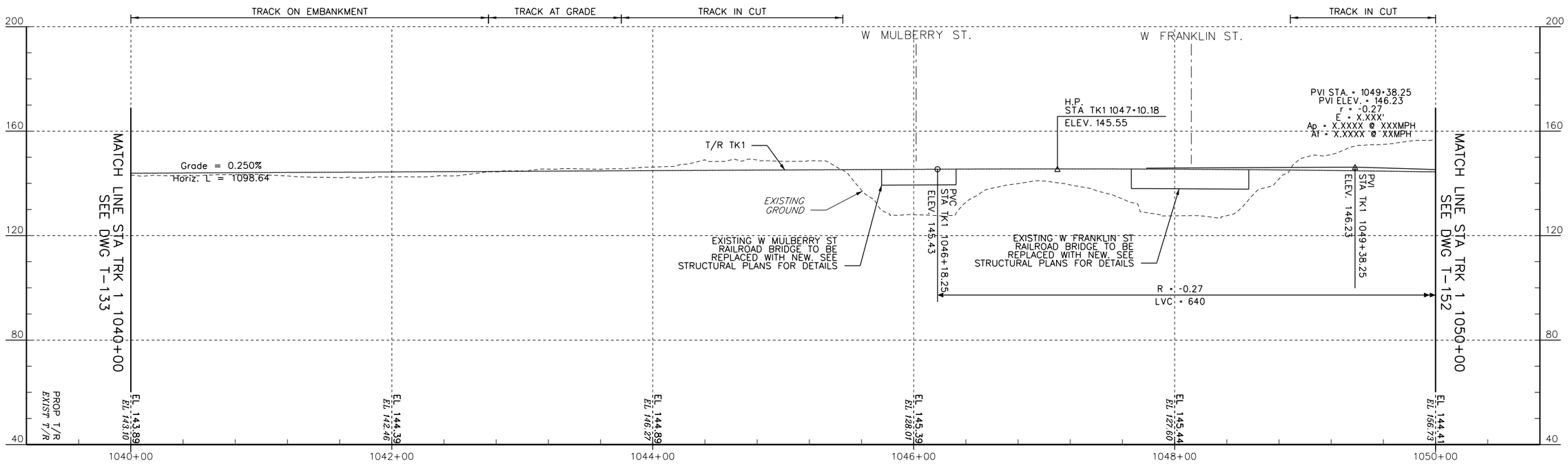
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

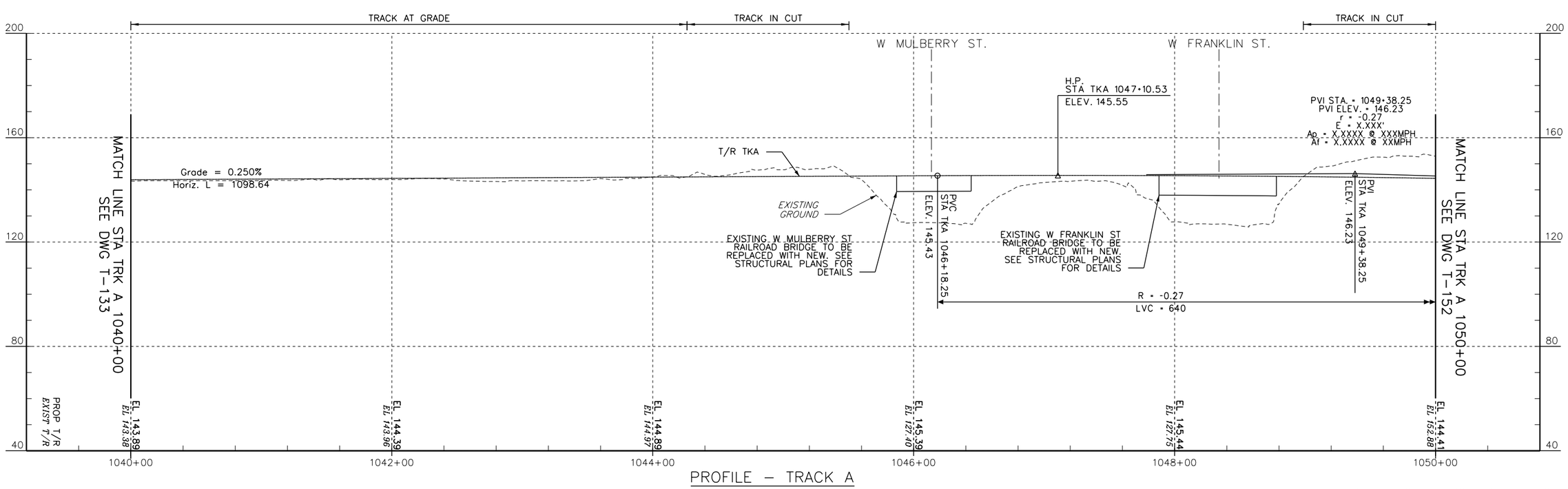
PROFILES – TRACK 2 & TRACK 3
STA. 1040+00 TO STA. 1050+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-142



PROFILE – TRACK 1



PROFILE – TRACK A

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved | Date

WORK IN PROGRESS

A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

PROFILES – TRACK A & TRACK 1
STA. 1040+00 TO STA. 1050+00

Designed DO | Drawn JB | Checked FB | Date 09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg No.	T-143

CURVE TA-2 – TRACK A

D_C = 1°-30'-00.00"		Δ_I = 40°-01'-38.62"	
L_{SA}/L_{SB} = 837.00'/372.00'		θ_S = 06°-16'-38.35"	
R = 3819.83'		Δ_C = 30°-57'-36.56"	
L_C = 2064.07'		θ_S = 02°-47'-23.71"	
T_S = 1802.92'/1587.40'		E = 143.79'	
E_Q = 1.00"		M = 138.57'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	1.13"	3.44"
V_{MPH}	=	45	65
JERK RATE ENT	=	16.52	3.75
JERK RATE EXT	=	7.34	1.67

CURVE T1-2 – TRACK 1

D_C = 1°-30'-00.00"		Δ_I = 41°-45'-23.84"	
L_{SA}/L_{SB} = 837.00'/837.00'		θ_S = 06°-16'-38.35"	
R = 3819.83'		Δ_C = 29°-12'-07.13"	
L_C = 1946.85'		θ_S = 06°-16'-38.35"	
T_S = 1878.24'/1878.24'		E = 127.48'	
E_Q = 5.50"		M = 123.36'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-3.37"	5.00"
V_{MPH}	=	45	100
JERK RATE ENT	=	-5.51	1.67
JERK RATE EXT	=	-5.51	1.67

CURVE T2-2 – TRACK 2

D_C = 1°-30'-00.00"		Δ_I = 43°-13'-25.12"	
L_{SA}/L_{SB} = 868.00'/837.00'		θ_S = 06°-30'-35.33"	
R = 3819.83'		Δ_C = 30°-26'-11.43"	
L_C = 2029.16'		θ_S = 06°-16'-38.35"	
T_S = 1949.52'/1935.49'		E = 138.82'	
E_Q = 5.50"		M = 133.95'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-2.88"	5.00"
V_{MPH}	=	50	100
JERK RATE ENT	=	-6.04	1.74
JERK RATE EXT	=	-5.82	1.67

CURVE T3-2 – TRACK 3

D_C = 1°-30'-00.00"		Δ_I = 44°-32'-22.23"	
L_{SA}/L_{SB} = 961.00'/372.00'		θ_S = 07°-12'-26.26"	
R = 137509.87'		Δ_C = 34°-32'-32.26"	
L_C = 2302.89'		θ_S = 02°-47'-24.71"	
T_S = 2036.44'/1763.08'		E = 180.37'	
E_Q = 1.00"		M = 172.23'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	1.13"	3.44"
V_{MPH}	=	45	65
JERK RATE ENT	=	18.97	4.30
JERK RATE EXT	=	7.34	1.67

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

No.	Revisions	Date	By

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved | Date

WORK IN PROGRESS

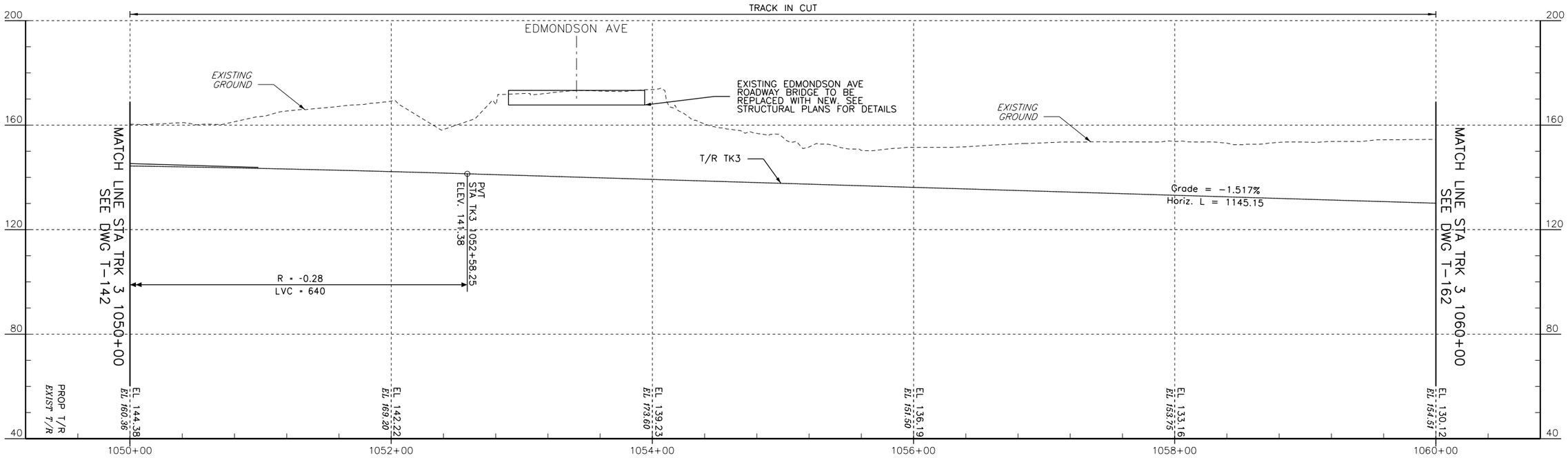
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

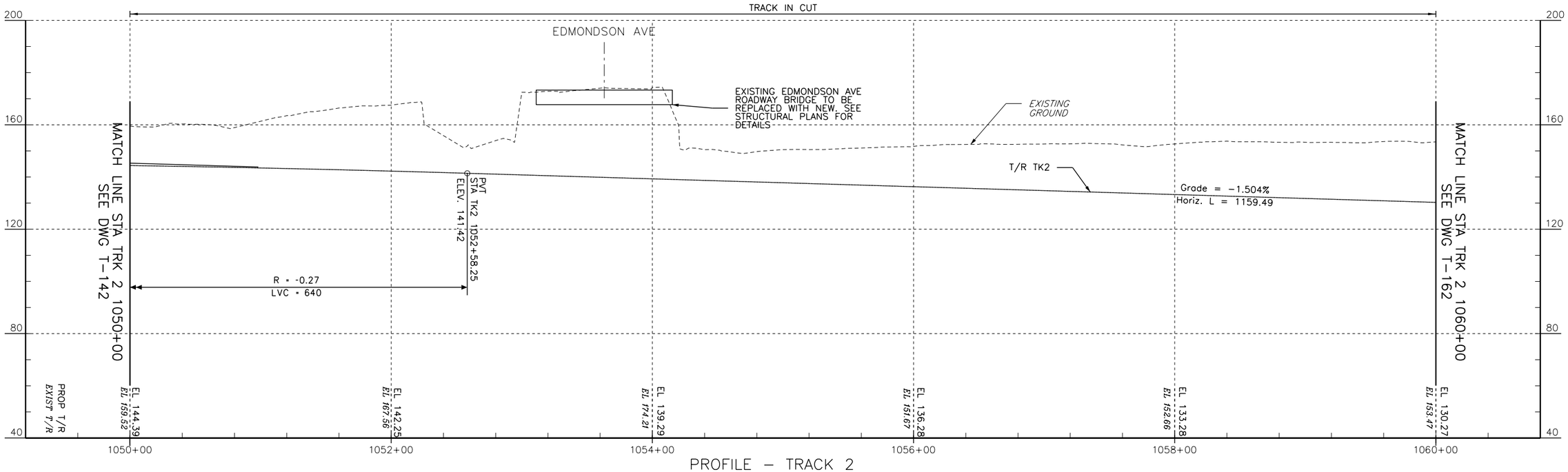
TRACK PLAN
STA TK2 1050+00 TO STA TK2 1060+00

Designed DO | Drawn JB | Checked FB | Date 09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-151



PROFILE – TRACK 3



PROFILE – TRACK 2

0 40 80
HORIZ. SCALE IN FEET

0 20 40
VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

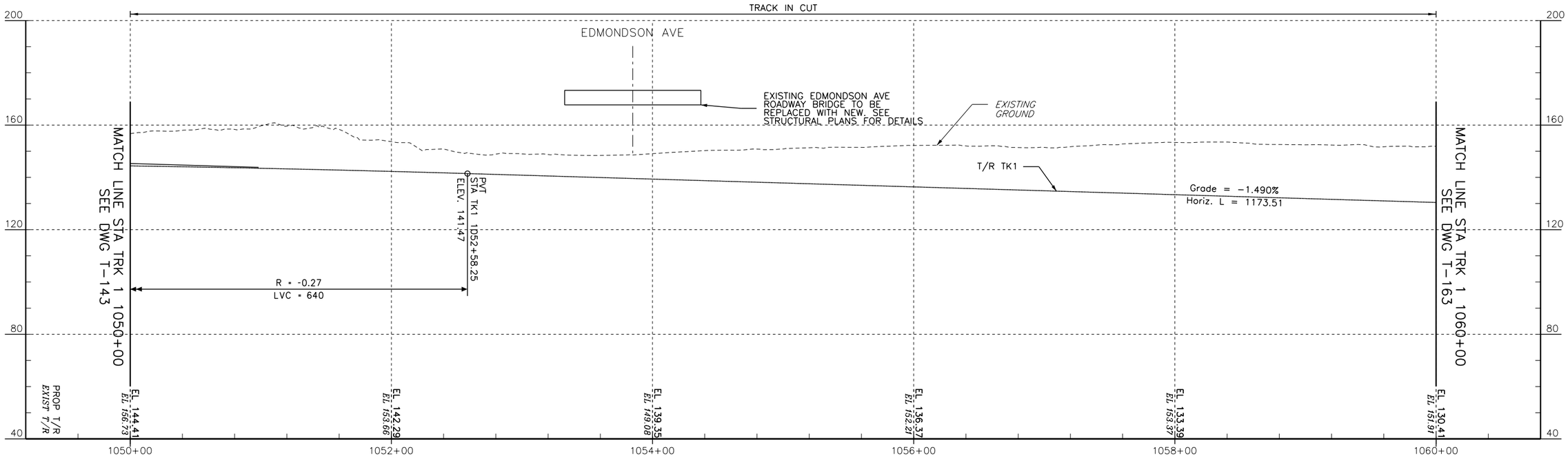
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

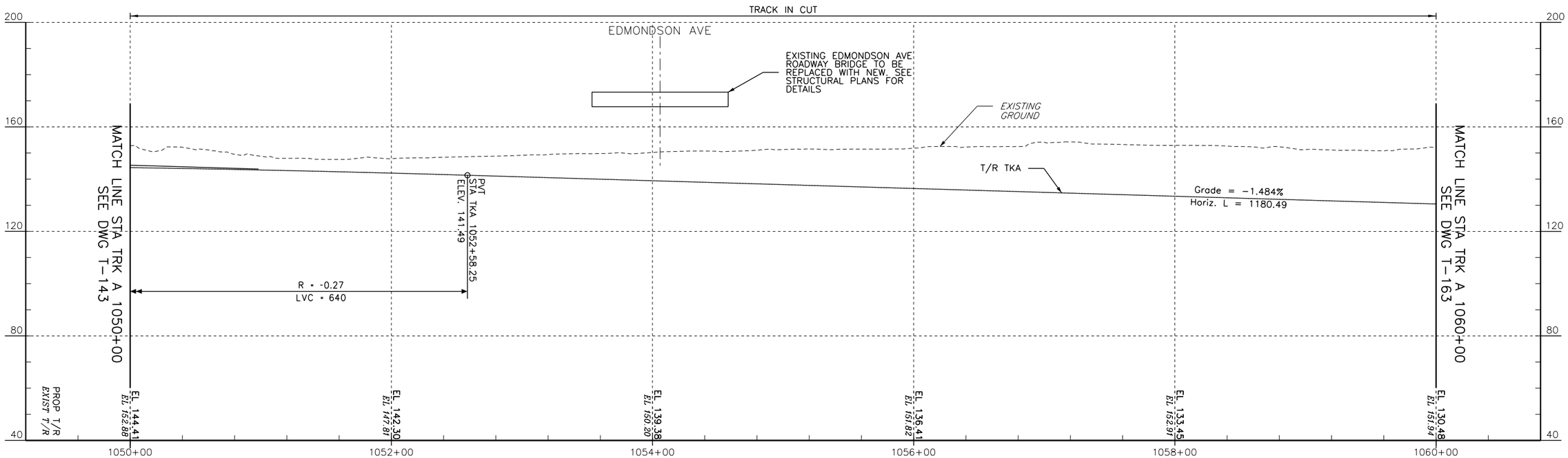
PROFILES – TRACK 2 & TRACK 3
STA. 1050+00 TO STA. 1060+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-152



PROFILE – TRACK 1



PROFILE – TRACK A

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved | Date

WORK IN PROGRESS

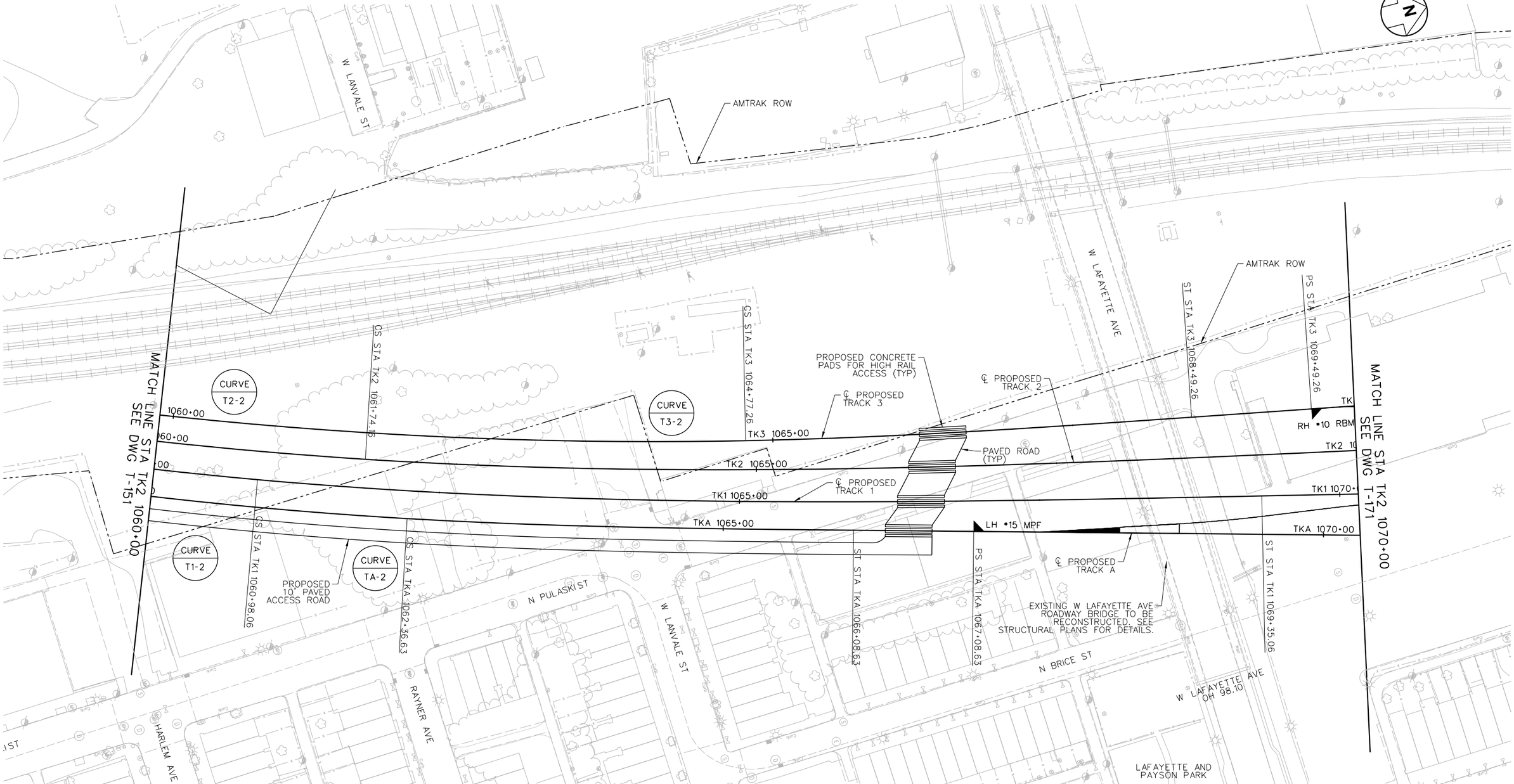
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

PROFILES – TRACK A & TRACK 1
STA. 1050+00 TO STA. 1060+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-153



CURVE TA–2 – TRACK A

D_C = 1°–30'–00.00"		Δ_I = 40°–01'–38.62"	
L_{SQ}/L_{SB} = 8374.00'/372.00'		θ_S = 06°–16'–38.35"	
R = 3819.83'		Δ_C = 30°–57'–36.56"	
L_C = 2064.07'		θ_S = 02°–47'–23.71"	
T_S = 1802.92'/1587.40'		E = 143.79'	
E_Q = 1.00"		M = 138.57'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	1.13"	3.44"
V_{MPH}	=	45	65
JERK RATE ENT	=	16.52	3.75
JERK RATE EXT	=	7.34	1.67

CURVE T1–2 – TRACK 1

D_C = 1°–30'–00.00"		Δ_I = 41°–45'–23.84"	
L_{SQ}/L_{SB} = 837.00'/837.00'		θ_S = 06°–16'–38.35"	
R = 3819.83'		Δ_C = 29°–12'–07.13"	
L_C = 1946.85'		θ_S = 06°–16'–38.35"	
T_S = 1878.24'/1878.24'		E = 127.48'	
E_Q = 5.50"		M = 123.36'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	–3.37"	5.00"
V_{MPH}	=	45	100
JERK RATE ENT	=	–5.51	1.67
JERK RATE EXT	=	–5.51	1.67

CURVE T2–2 – TRACK 2

D_C = 1°–30'–00.00"		Δ_I = 43°–13'–25.12"	
L_{SQ}/L_{SB} = 868.00'/837.00'		θ_S = 06°–30'–35.33"	
R = 3819.83'		Δ_C = 30°–26'–11.43"	
L_C = 2029.16'		θ_S = 06°–16'–38.35"	
T_S = 1949.52'/1935.49'		E = 138.82'	
E_Q = 5.50"		M = 133.95'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	–2.88"	5.00"
V_{MPH}	=	50	100
JERK RATE ENT	=	–6.04	1.74
JERK RATE EXT	=	–5.82	1.67

CURVE T3–2 – TRACK 3

D_C = 1°–30'–00.00"		Δ_I = 44°–32'–22.23"	
L_{SQ}/L_{SB} = 961.00'/372.00'		θ_S = 07°–12'–26.26"	
R = 137509.87'		Δ_C = 34°–32'–32.26"	
L_C = 2302.89'		θ_S = 02°–47'–24.71"	
T_S = 2036.44'/1763.08'		E = 180.37'	
E_Q = 1.00"		M = 172.23'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	1.13"	3.44"
V_{MPH}	=	45	65
JERK RATE ENT	=	18.97	4.30
JERK RATE EXT	=	7.34	1.67

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved | Date

WORK IN PROGRESS

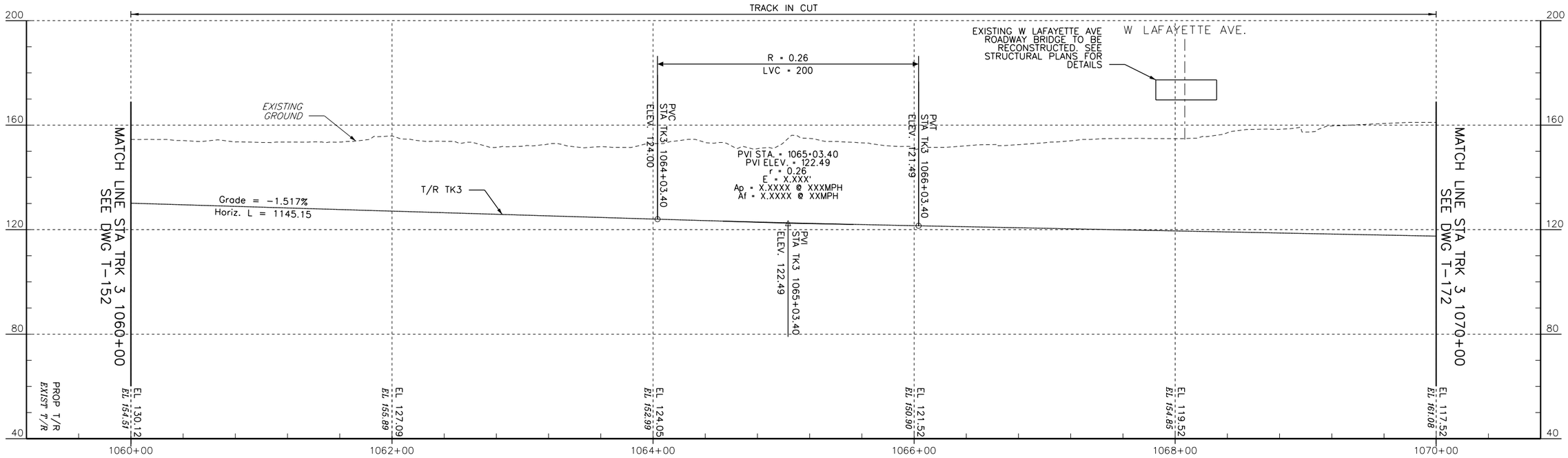
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

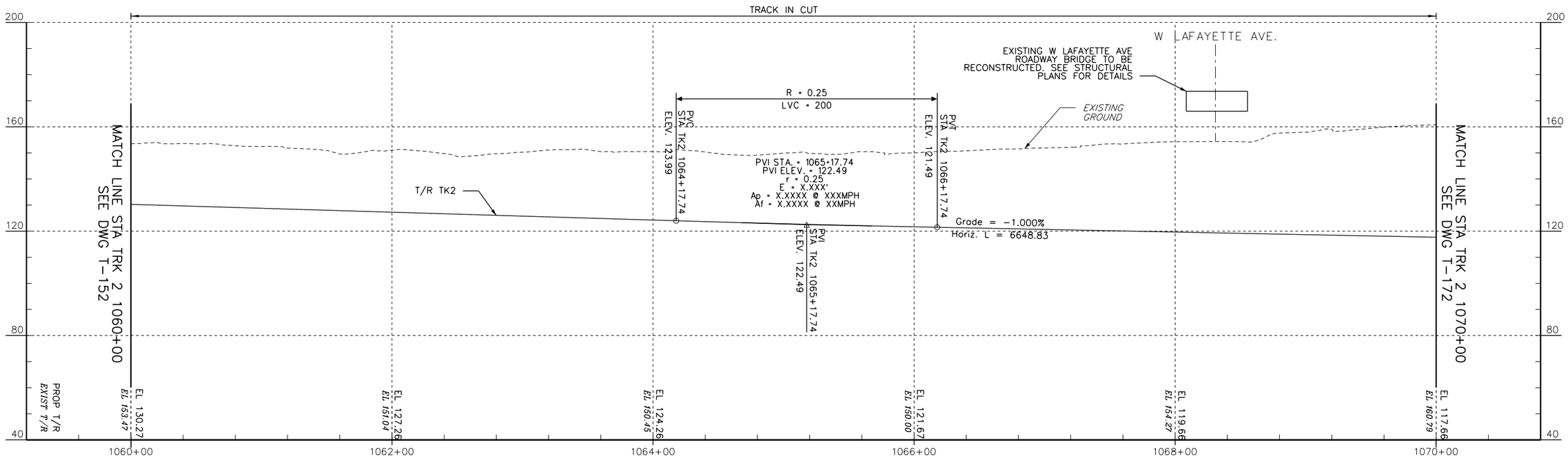
TRACK PLAN
STA TK2 1060+00 TO STA TK2 1070+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T–161



PROFILE – TRACK 3



PROFILE – TRACK 2

0 40 80
HORIZ. SCALE IN FEET

0 20 40
VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

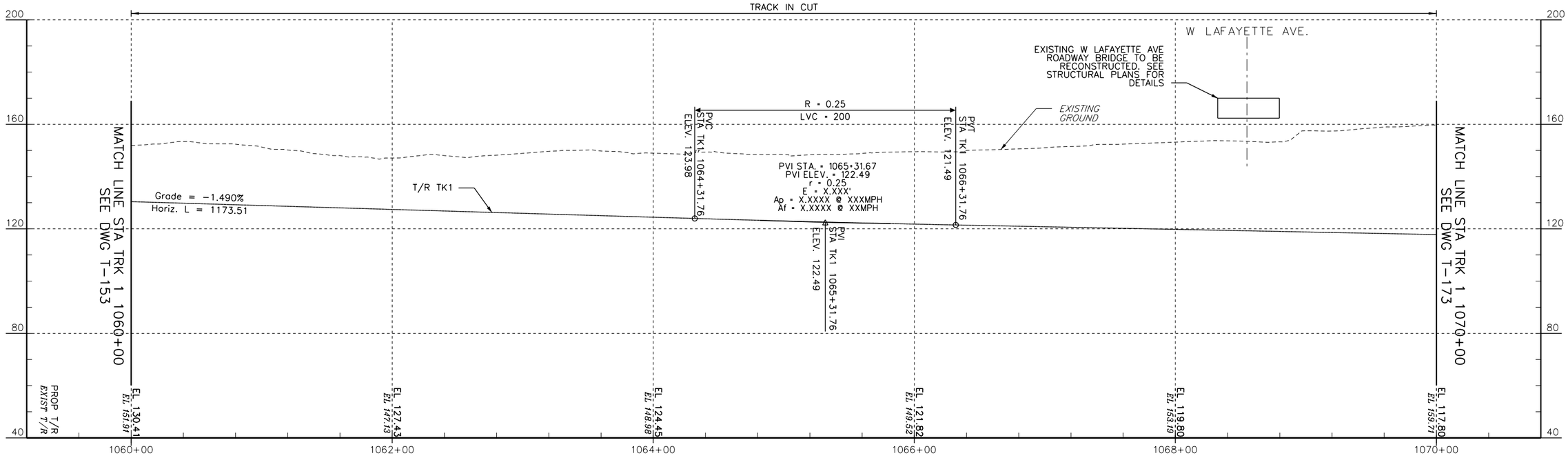
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

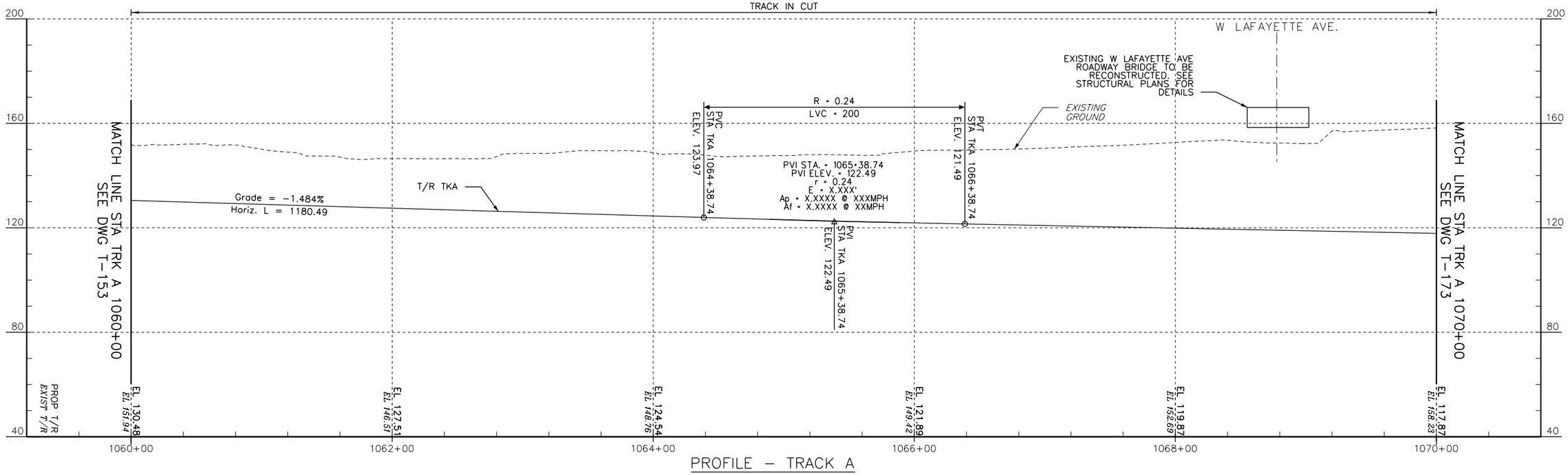
PROFILES – TRACK 2 & TRACK 3
STA. 1060+00 TO STA. 1070+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-162



PROFILE – TRACK 1



PROFILE – TRACK A

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved | Date

WORK IN PROGRESS

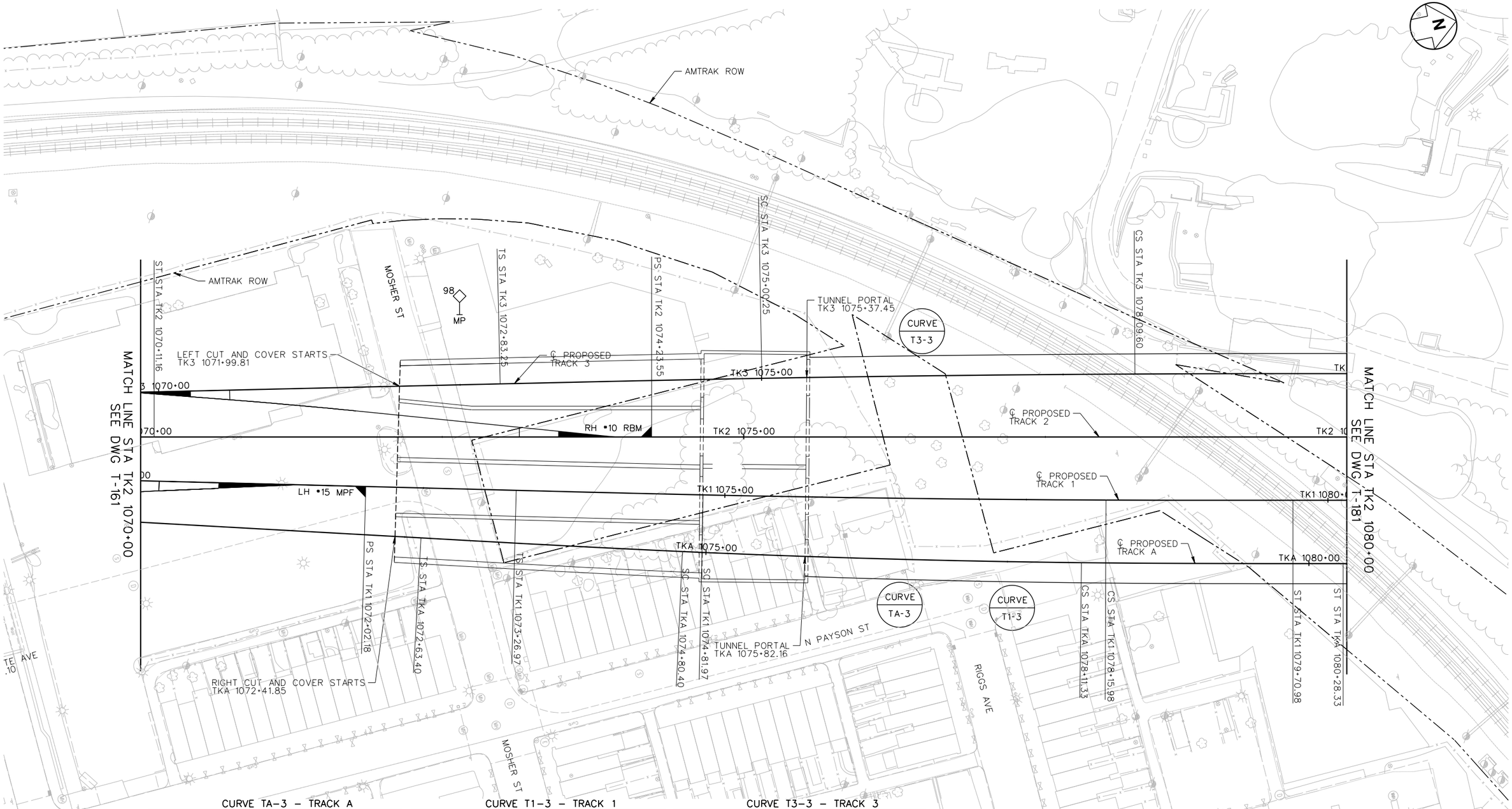
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

PROFILES – TRACK A & TRACK 1
STA. 1060+00 TO STA. 1070+00

Designed DO | Drawn JB | Checked FB | Date 09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-163



CURVE TA-3 – TRACK A

D_C = 0°-35'-00.00"		Δ_I = 03°-11'-46.49"	
L_{sg}/L_{sb} = 217.00'/217.00'		θ_S = 00°-37'-58.49"	
R = 9822.17'		Δ_C = 01°-55'-49.51"	
L_C = 330.93'		θ_S = 00°-37'-58.49"	
T_S = 382.54'/382.54'		E = 1.39'	
E_q = 1.00"		M = 1.39'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	0.02"	1.61"
V_{MPH}	=	50	80
JERK RATE ENT	=	210.17	1.68
JERK RATE EXT	=	210.17	1.68

CURVE T1-3 – TRACK 1

D_C = 0°-18'-00.00"		Δ_I = 01°-28'-01.28"	
L_{sg}/L_{sb} = 155.00'/155.00'		θ_S = 00°-13'-57.00"	
R = 19098.62'		Δ_C = 01°-00'-07.28"	
L_C = 334.01'		θ_S = 00°-13'-57.00"	
T_S = 322.02'/322.02'		E = 0.73'	
E_q = 1.75"		M = 0.73'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-1.23"	0.35"
V_{MPH}	=	50	100
JERK RATE ENT	=	-2.53	4.43
JERK RATE EXT	=	-2.53	4.43

CURVE T3-3 – TRACK 3

D_C = 0°-15'-00.00"		Δ_I = 01°-18'-57.12"	
L_{sg}/L_{sb} = 217.00'/217.00'		θ_S = 00°-16'-16.50"	
R = 22918.33		Δ_C = 00°-46'-24.12"	
L_C = 309.35'		θ_S = 00°-16'-16.50"	
T_S = 371.69'/371.69'		E = 0.52'	
E_q = 0.50"		M = 0.52'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-0.06"	1.25"
V_{MPH}	=	50	50
JERK RATE ENT	=	-69.35	1.74
JERK RATE EXT	=	-69.35	1.74

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved Date

WORK IN PROGRESS

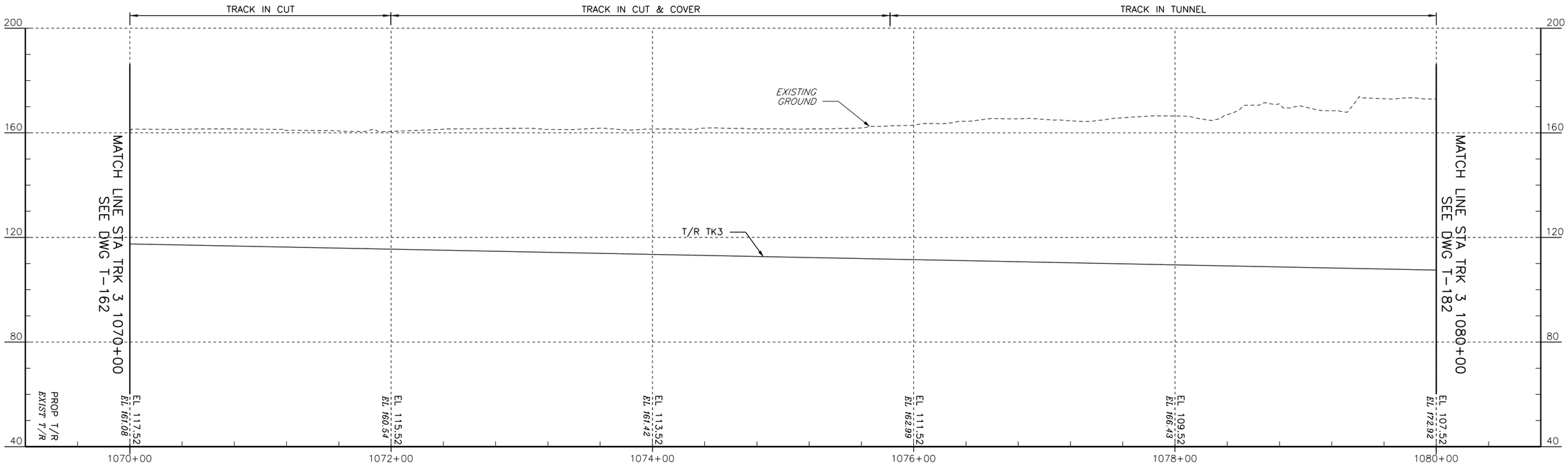
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

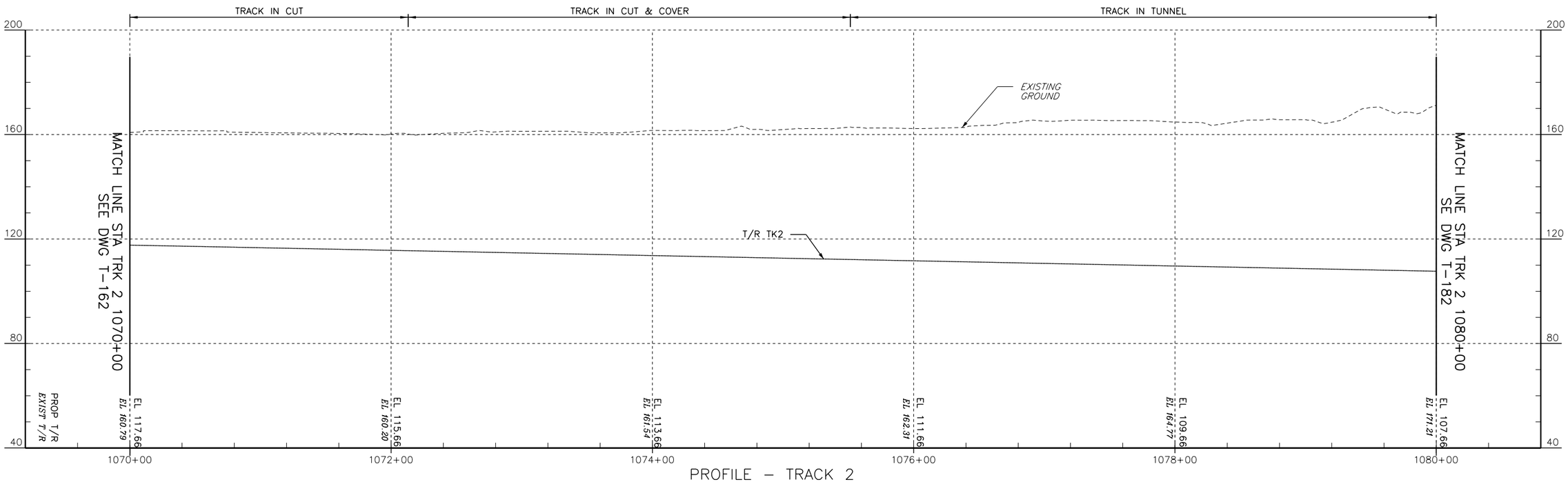
TRACK PLAN
STA TK2 1070+00 TO STA TK2 1080+00

Designed	Drawn	Checked	Date
DO	JB	FB	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-171



PROFILE – TRACK 3



PROFILE – TRACK 2

0 40 80
HORIZ. SCALE IN FEET

0 20 40
VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

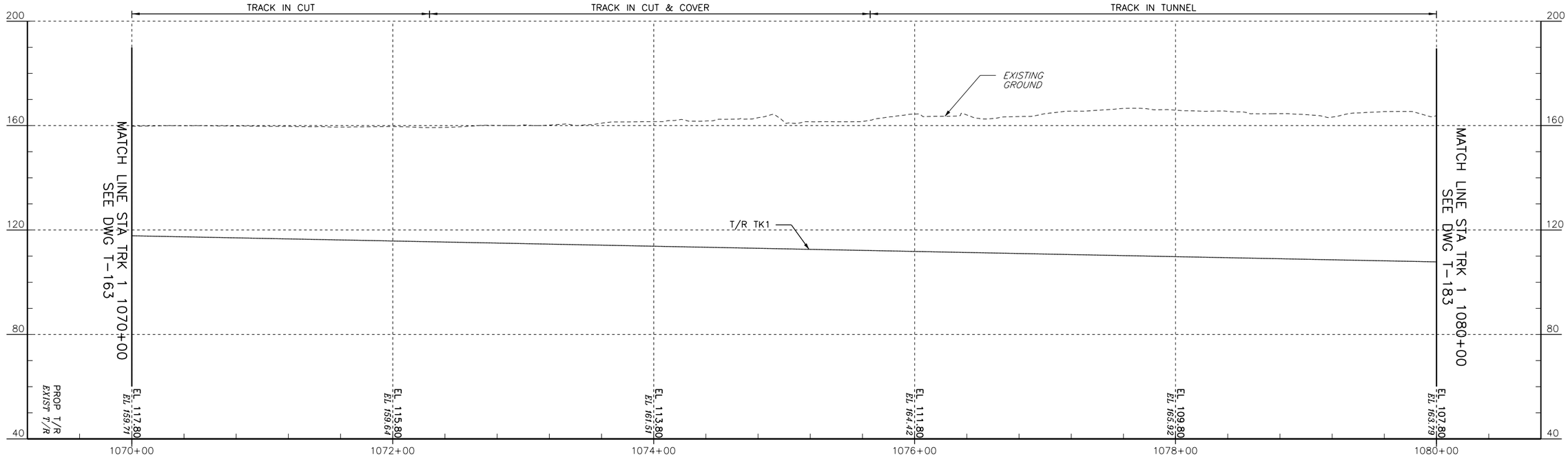
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

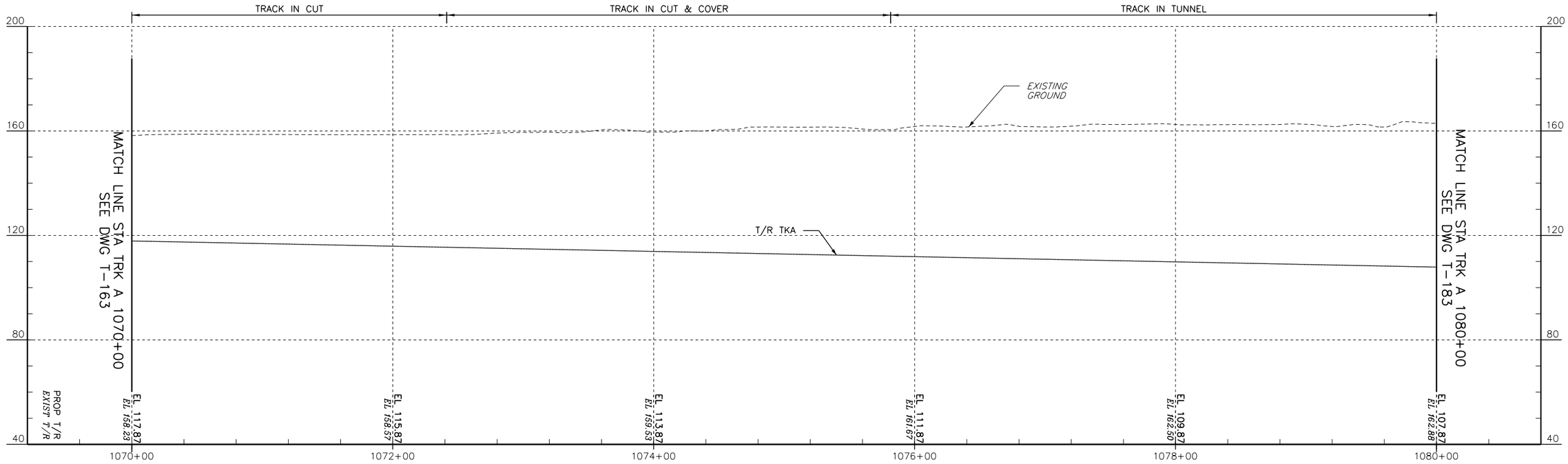
PROFILES – TRACK 2 & TRACK 3
STA. 1070+00 TO STA. 1080+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-172



PROFILE – TRACK 1



PROFILE – TRACK A

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

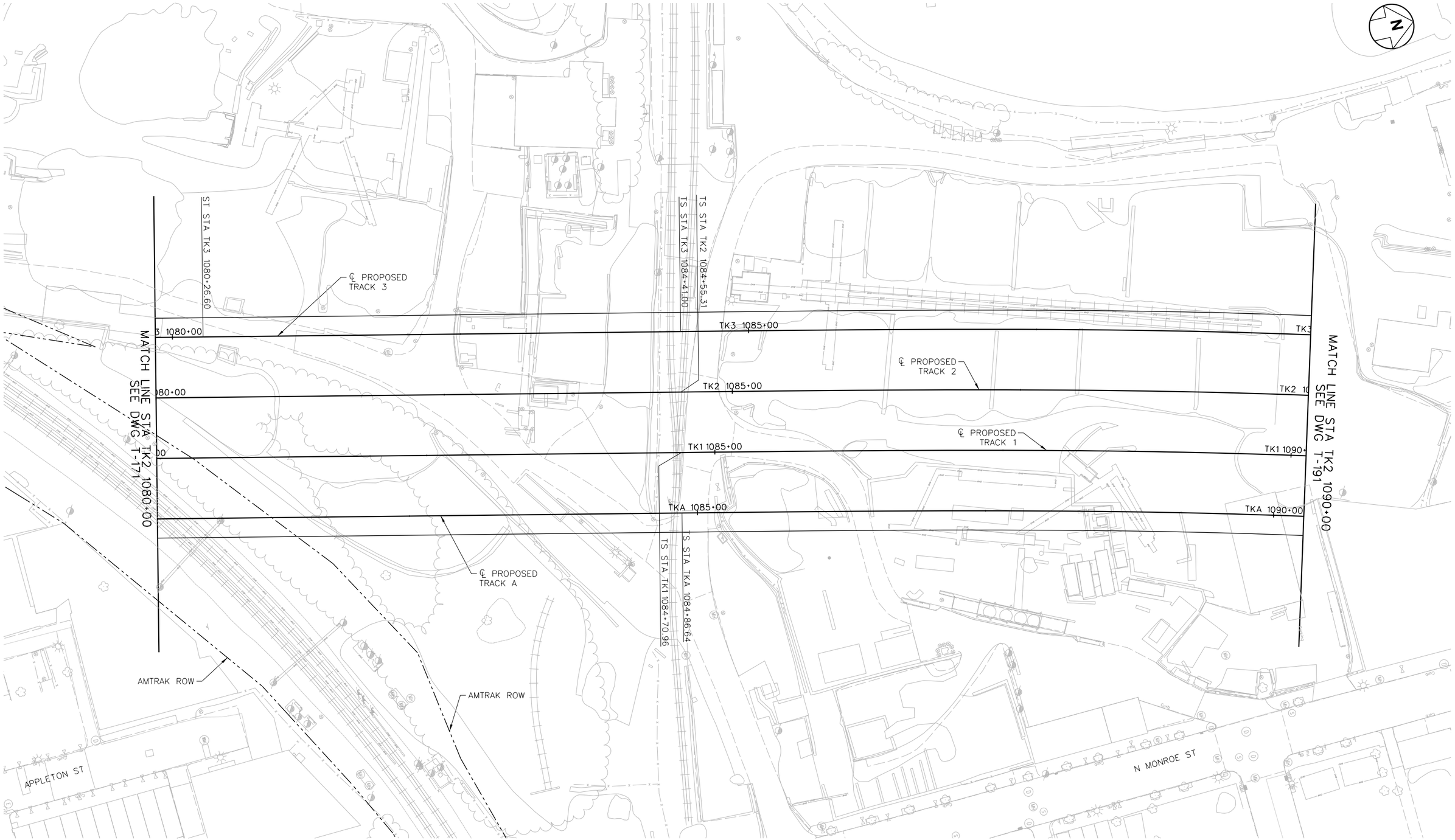
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

PROFILES – TRACK A & TRACK 1
STA. 1070+00 TO STA. 1080+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-173



No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

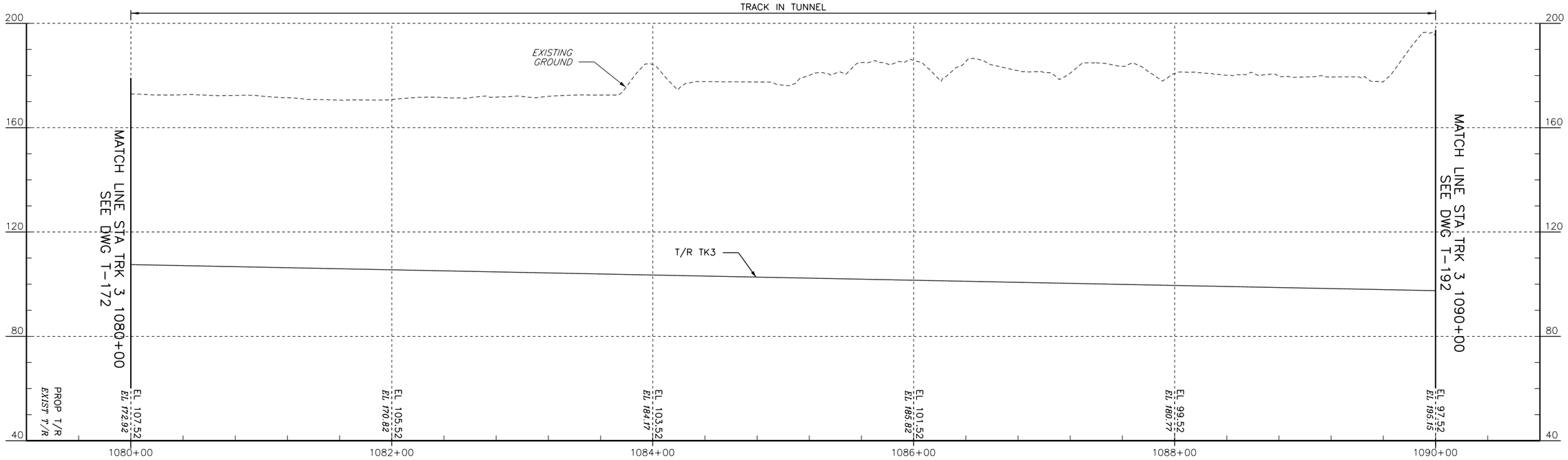
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

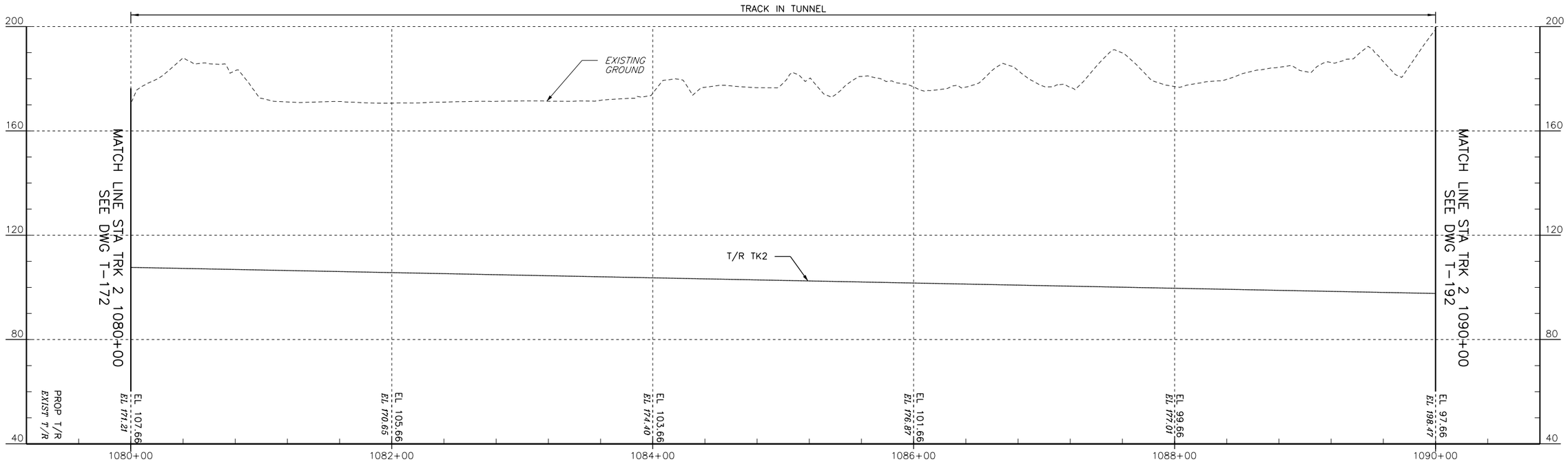
TRACK PLAN
STA TK2 1080+00 TO STA TK2 1090+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-181



PROFILE – TRACK 3



PROFILE – TRACK 2

0 40 80
HORIZ. SCALE IN FEET

0 20 40
VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

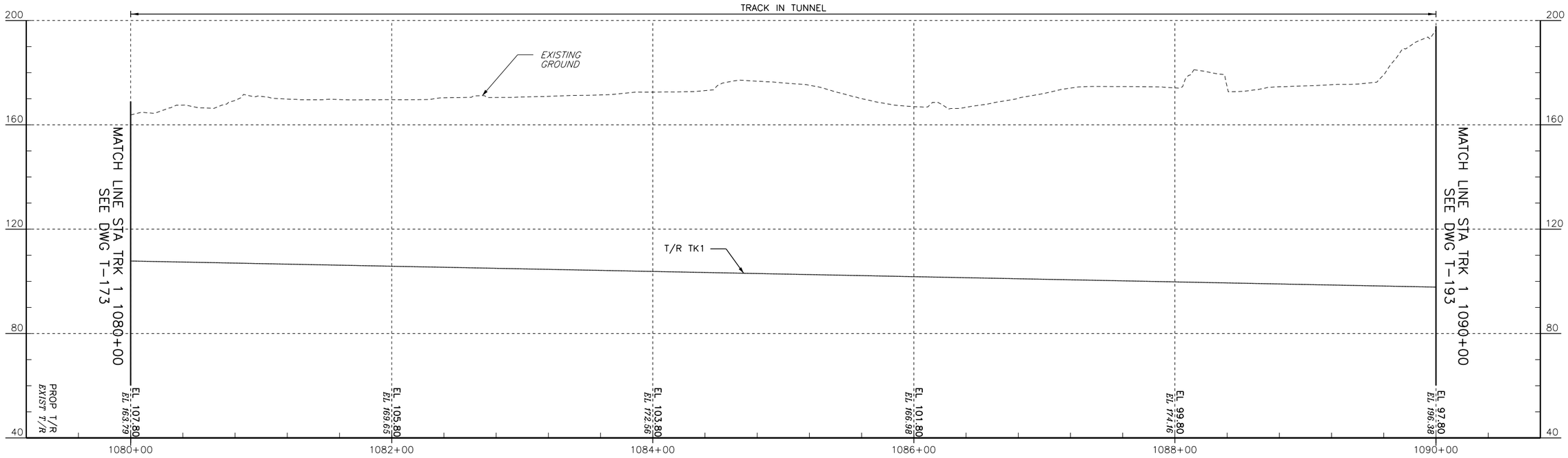
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

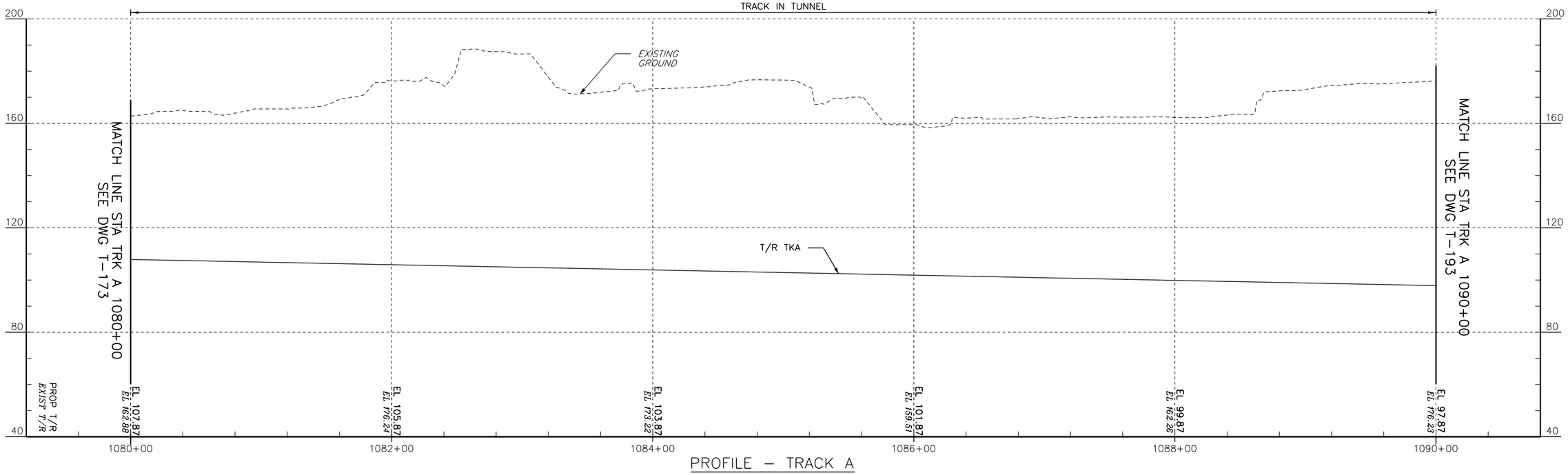
PROFILES – TRACK 2 & TRACK 3
STA. 1080+00 TO STA. 1090+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-182



PROFILE – TRACK 1



PROFILE – TRACK A

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved | Date

WORK IN PROGRESS

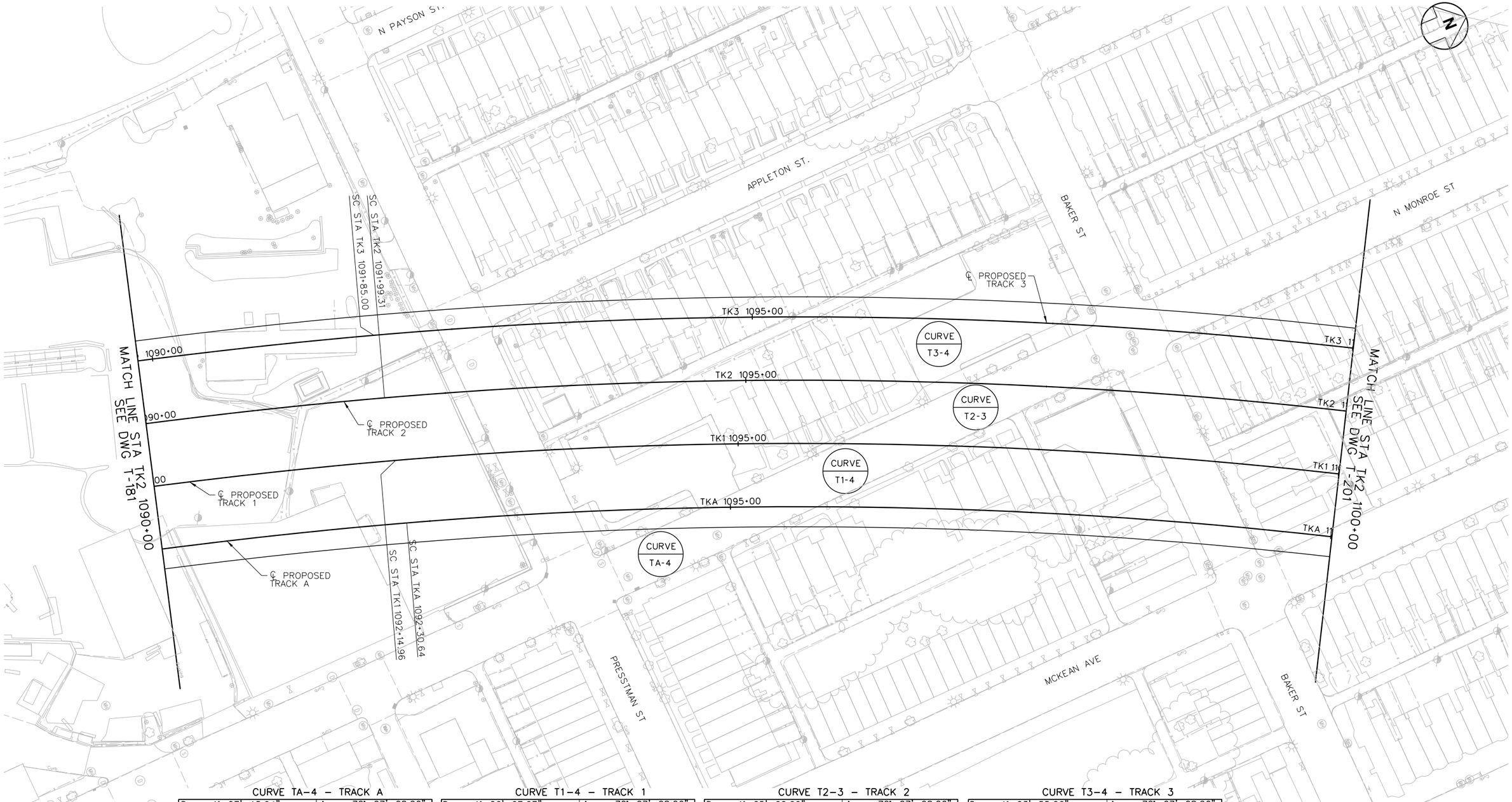
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

PROFILES – TRACK A & TRACK 1
STA. 1080+00 TO STA. 1090+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-183



CURVE TA-4 – TRACK A

D_C = 1°-27'-15.94"	Δ_1 = 72°-07'-08.26"		
L_{SA}/L_{SB} = 744.00'/744.00'	θ_S = 05°-24'-37.17"		
R = 3939.51'	Δ_C = 61°-17'-53.92"		
L_C = 4214.71'	θ_S = 05°-24'-37.17"		
T_S = 3244.63'/3244.63'	E = 639.69'		
E_Q = 2.75"	M = 550.33'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-0.21"	3.76"
V_{MPH}	=	50	50
JERK RATE ENT	=	-72.49	2.47
JERK RATE EXT	=	-72.49	2.47

CURVE T1-4 – TRACK 1

D_C = 1°-26'-07.07"	Δ_1 = 72°-07'-08.26"		
L_{SA}/L_{SB} = 744.00'/744.00'	θ_S = 05°-20'-21.02"		
R = 3992.01'	Δ_C = 61°-26'-26.22"		
L_C = 4280.80'	θ_S = 05°-20'-21.02"		
T_S = 3282.80'/3282.80'	E = 651.64'		
E_Q = 5.50"	M = 560.19'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-2.99"	4.55"
V_{MPH}	=	50	100
JERK RATE ENT	=	-4.98	1.64
JERK RATE EXT	=	-4.98	1.64

CURVE T2-3 – TRACK 2

D_C = 1°-25'-00.00"	Δ_1 = 72°-07'-08.26"		
L_{SA}/L_{SB} = 744.00'/744.00'	θ_S = 05°-16'-11.52"		
R = 4044.51'	Δ_C = 61°-34'-45.22"		
L_C = 4346.88'	θ_S = 05°-16'-11.52"		
T_S = 3320.98'/3320.98'	E = 663.59'		
E_Q = 5.50"	M = 570.06'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-3.02"	4.41"
V_{MPH}	=	50	100
JERK RATE ENT	=	-4.92	1.69
JERK RATE EXT	=	-4.92	1.69

CURVE T3-4 – TRACK 3

D_C = 1°-23'-55.26"	Δ_1 = 72°-07'-08.26"		
L_{SA}/L_{SB} = 744.00'/744.00'	θ_S = 05°-12'-10.70"		
R = 4096.51'	Δ_C = 61°-42'-46.86"		
L_C = 4412.33'	θ_S = 05°-12'-10.70"		
T_S = 3358.79'/3358.79'	E = 675.45'		
E_Q = 2.50"	M = 579.84'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-0.05"	2.30"
V_{MPH}	=	50	50
JERK RATE ENT	=	-281.84	4.63
JERK RATE EXT	=	-281.84	4.63

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved Date

WORK IN PROGRESS

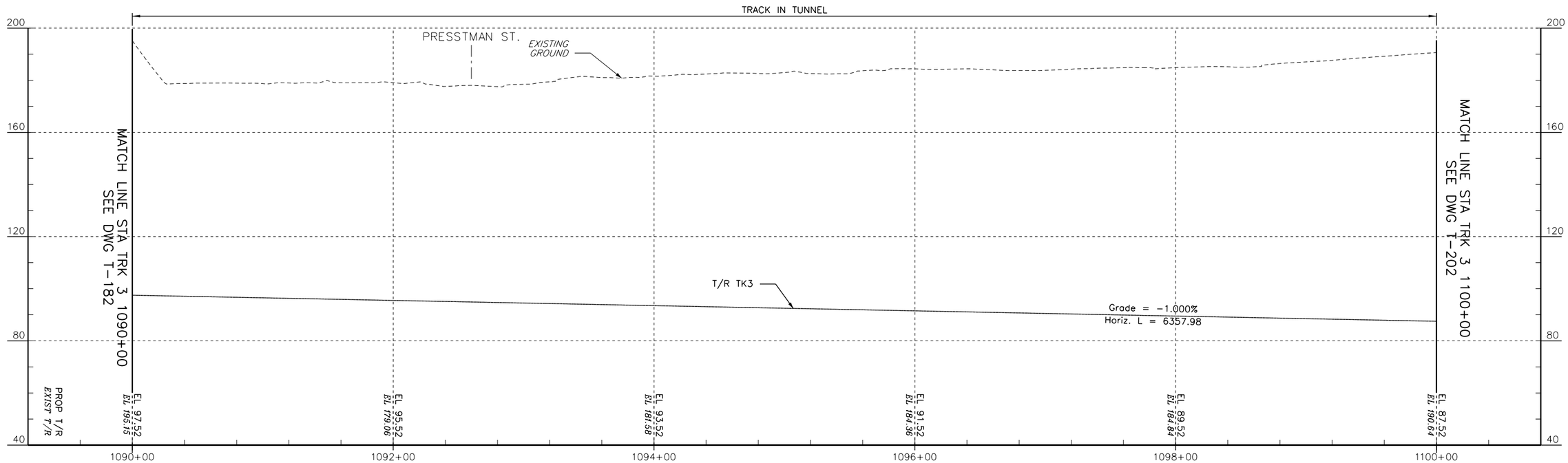
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

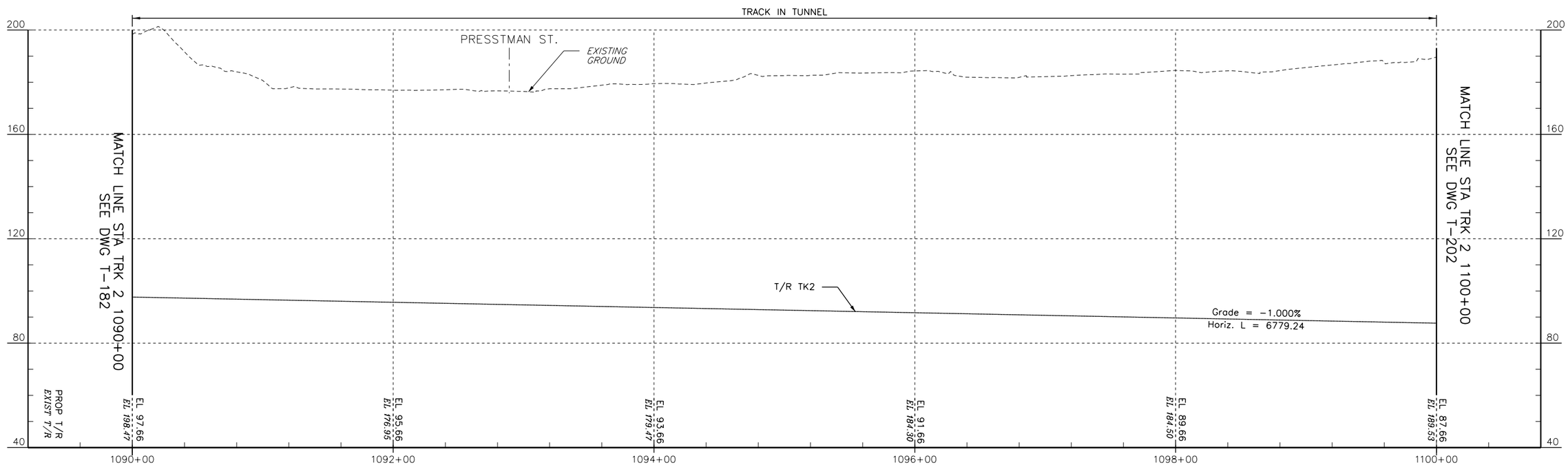
TRACK PLAN
STA TK2 1090+00 TO STA TK2 1100+00

Designed	Drawn	Checked	Date
DO	JB	FB	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-191



PROFILE – TRACK 3



PROFILE – TRACK 2

0 40 80
HORIZ. SCALE IN FEET

0 20 40
VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved | Date

WORK IN PROGRESS

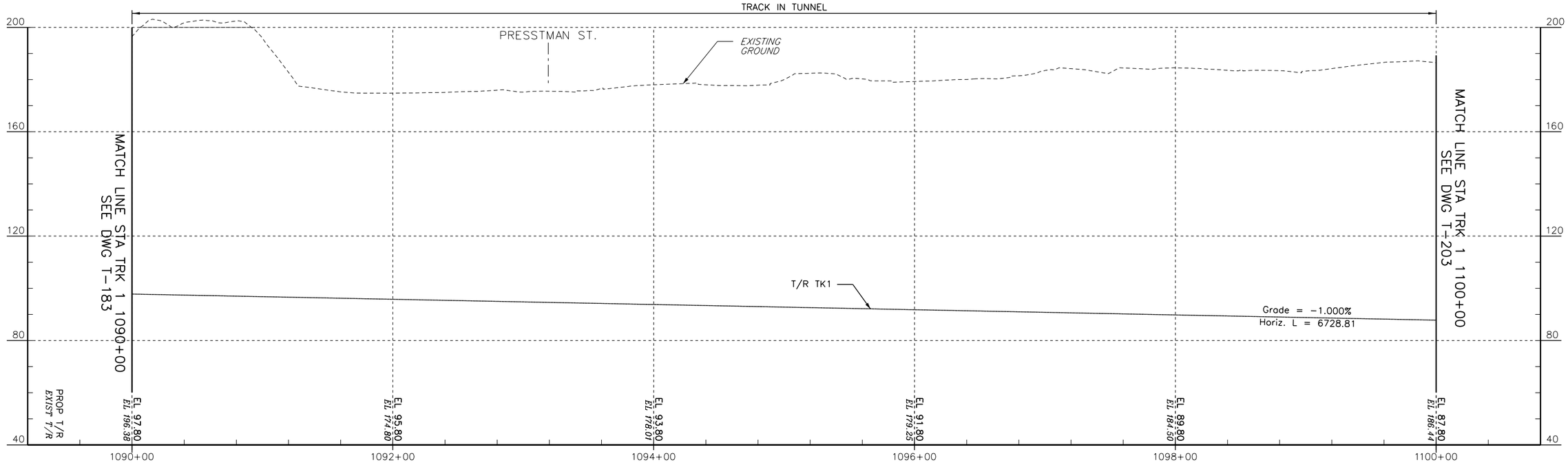
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

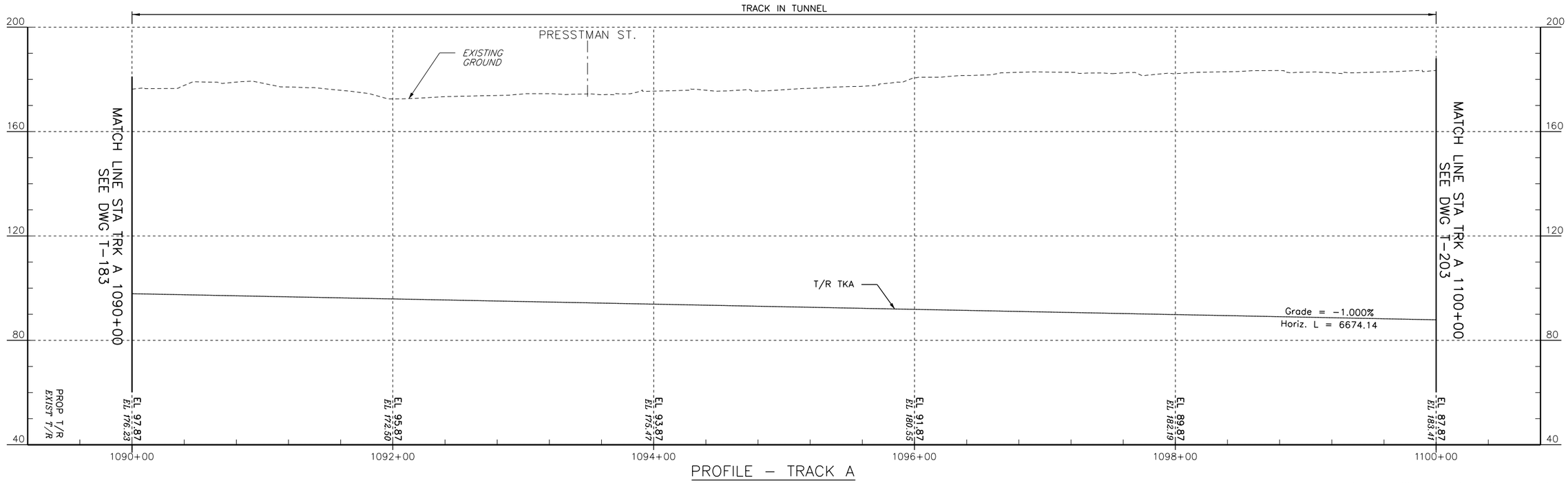
PROFILES – TRACK 2 & TRACK 3
STA. 1090+00 TO STA. 1100+00

Designed	Drawn	Checked	Date
DO	JB	FB	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T−192



PROFILE – TRACK 1



PROFILE – TRACK A

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

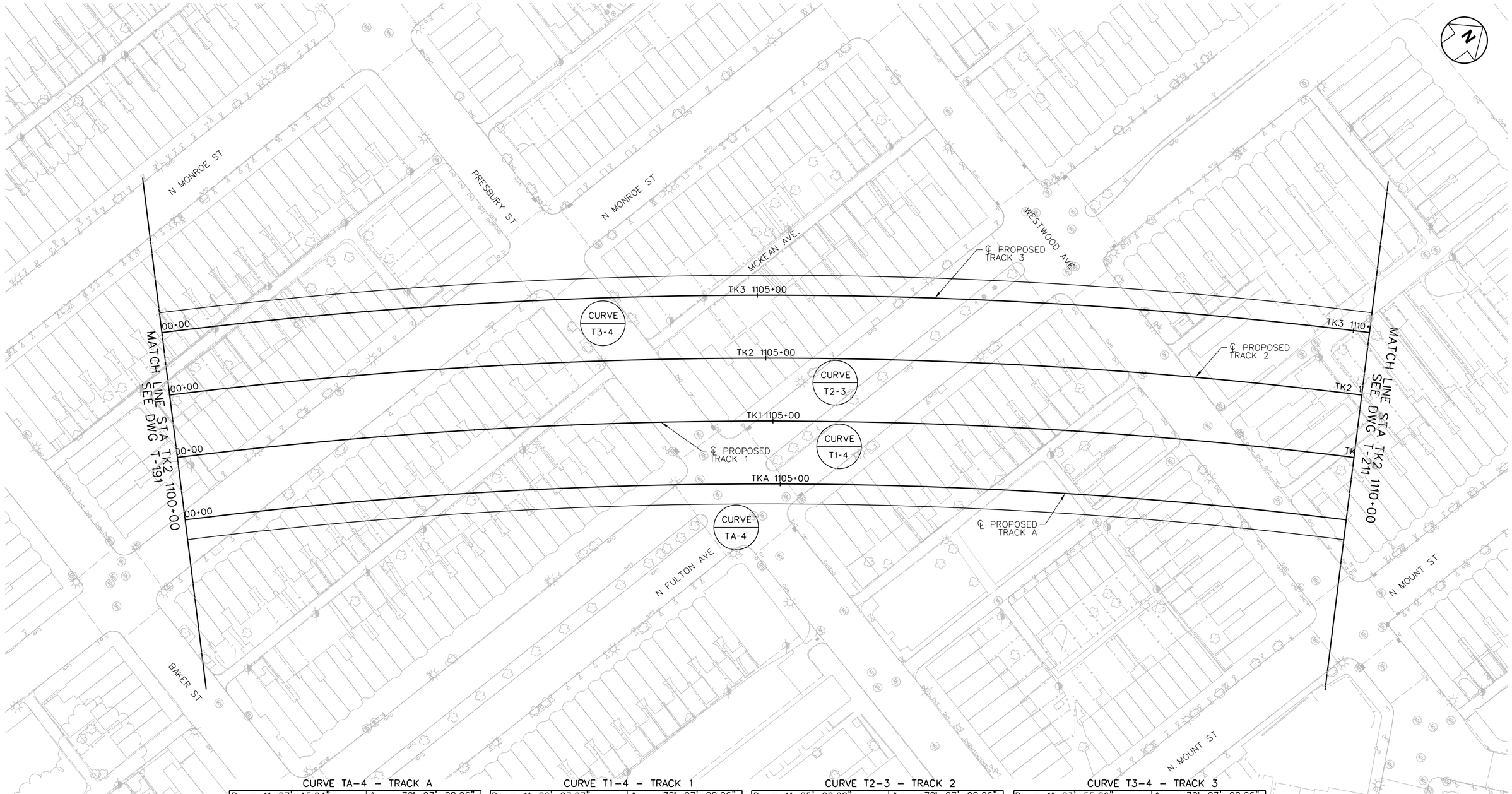
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

PROFILES – TRACK A & TRACK 1
STA. 1090+00 TO STA. 1100+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-193



CURVE TA–4 – TRACK A

D_C = 1°–27'–15.94"	Δ_I = 72°–07'–08.26"		
L_{SQ}/L_{SB} = 744.00'/744.00'	θ_S = 05°–24'–37.17"		
R = 3939.51'	Δ_C = 61°–17'–53.92"		
L_C = 4214.71'	θ_S = 05°–24'–37.17"		
T_S = 3244.63'/3244.63'	E = 639.69'		
E_Q = 2.75"	M = 550.33'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	–0.21"	3.76"
V_{MPH}	=	50	50
JERK RATE ENT	=	–72.49	2.47
JERK RATE EXT	=	–72.49	2.47

CURVE T1–4 – TRACK 1

D_C = 1°–26'–07.07"	Δ_I = 72°–07'–08.26"		
L_{SQ}/L_{SB} = 744.00'/744.00'	θ_S = 05°–20'–21.02"		
R = 3992.01'	Δ_C = 61°–26'–26.22"		
L_C = 4280.80'	θ_S = 05°–20'–21.02"		
T_S = 3282.80'/3282.80'	E = 651.64'		
E_Q = 5.50"	M = 560.19'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	–2.99"	4.55"
V_{MPH}	=	50	100
JERK RATE ENT	=	–4.98	1.64
JERK RATE EXT	=	–4.98	1.64

CURVE T2–3 – TRACK 2

D_C = 1°–25'–00.00"	Δ_I = 72°–07'–08.26"		
L_{SQ}/L_{SB} = 744.00'/744.00'	θ_S = 05°–16'–11.52"		
R = 4044.51'	Δ_C = 61°–34'–45.22"		
L_C = 4346.88'	θ_S = 05°–16'–11.52"		
T_S = 3320.98'/3320.98'	E = 663.59'		
E_Q = 5.50"	M = 570.06'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	–3.02"	4.41"
V_{MPH}	=	50	100
JERK RATE ENT	=	–4.92	1.69
JERK RATE EXT	=	–4.92	1.69

CURVE T3–4 – TRACK 3

D_C = 1°–23'–55.26"	Δ_I = 72°–07'–08.26"		
L_{SQ}/L_{SB} = 744.00'/744.00'	θ_S = 05°–12'–10.70"		
R = 4096.51'	Δ_C = 61°–42'–46.86"		
L_C = 4412.33'	θ_S = 05°–12'–10.70"		
T_S = 3358.79'/3358.79'	E = 675.45'		
E_Q = 2.50"	M = 579.84'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	–0.05"	2.30"
V_{MPH}	=	50	50
JERK RATE ENT	=	–281.84	4.63
JERK RATE EXT	=	–281.84	4.63

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved | Date

WORK IN PROGRESS

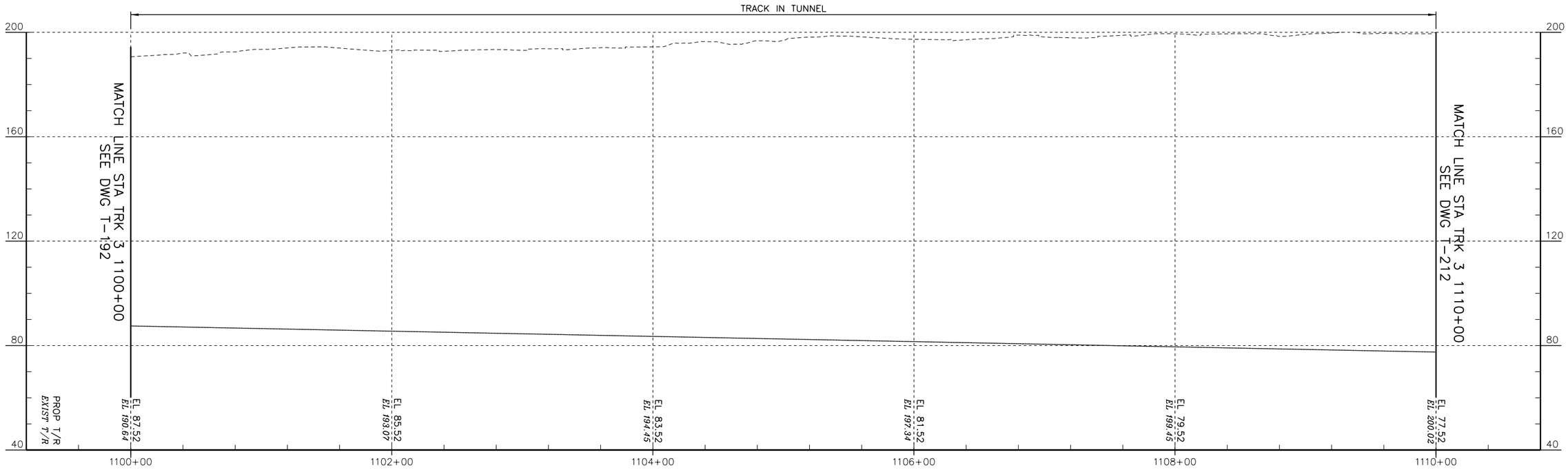
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

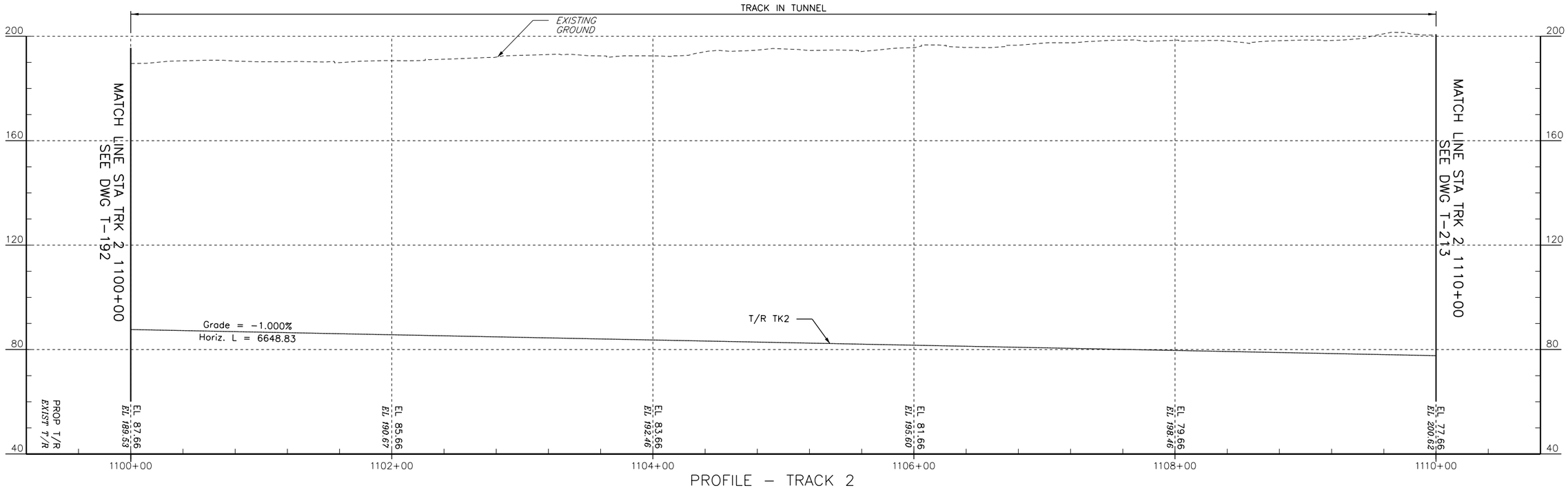
TRACK PLAN
STA TK2 1100+00 TO STA TK2 1110+00

Designed DO | Drawn JB | Checked FB | Date 09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T–201



PROFILE – TRACK 3



PROFILE – TRACK 2

0 40 80
HORIZ. SCALE IN FEET

0 20 40
VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

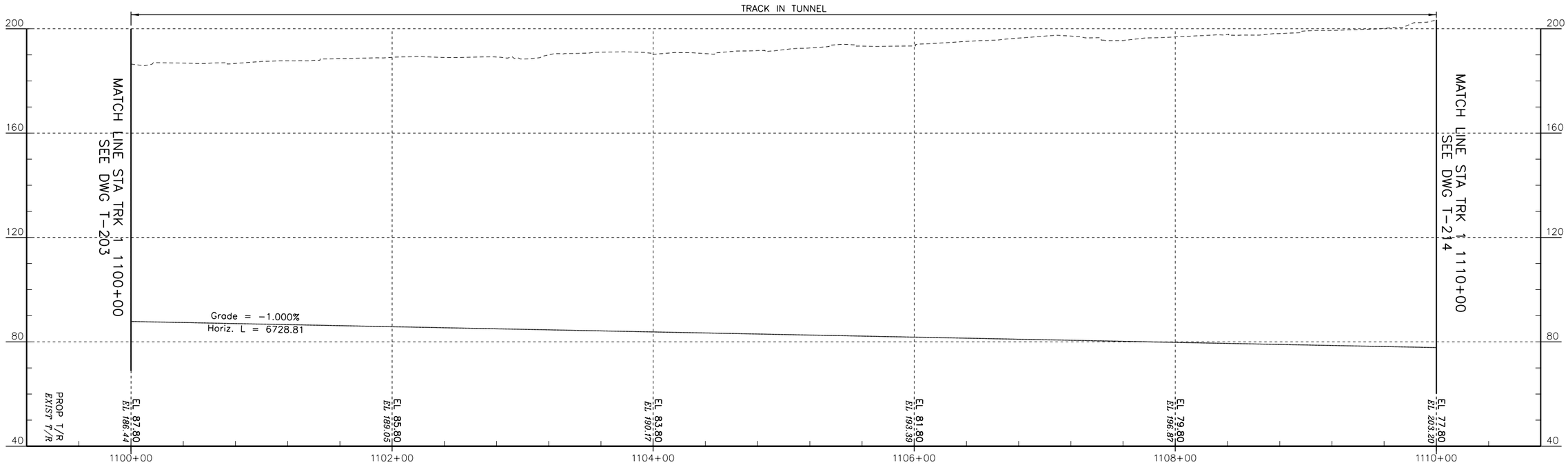
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

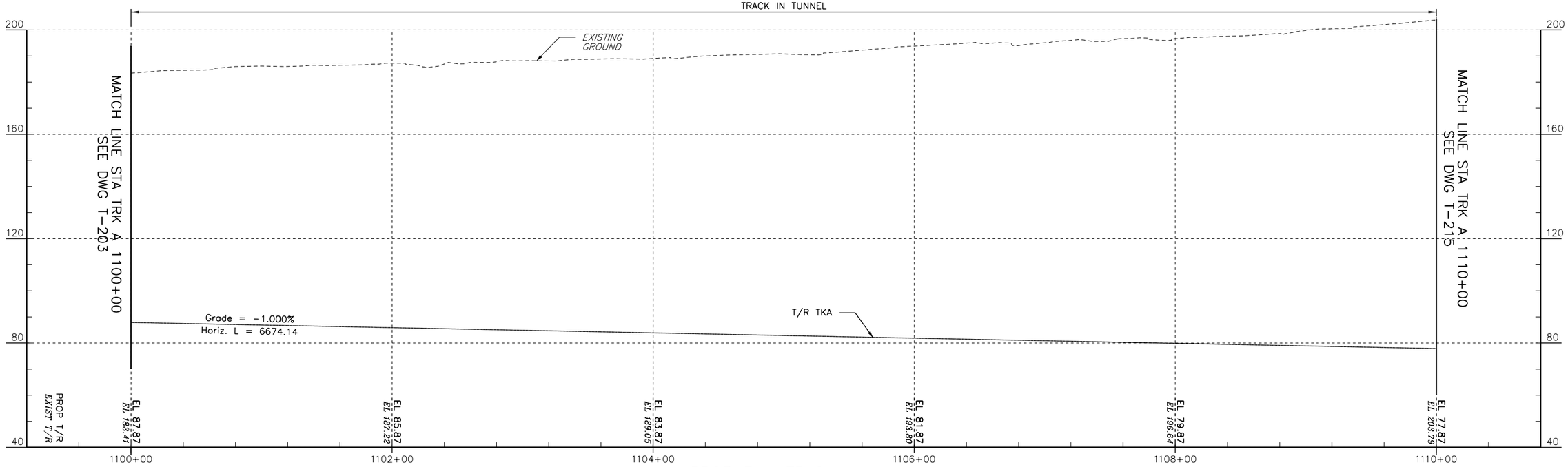
PROFILES – TRACK 2 & TRACK 3
STA. 1100+00 TO STA. 1110+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-202



PROFILE – TRACK 1



PROFILE – TRACK A

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

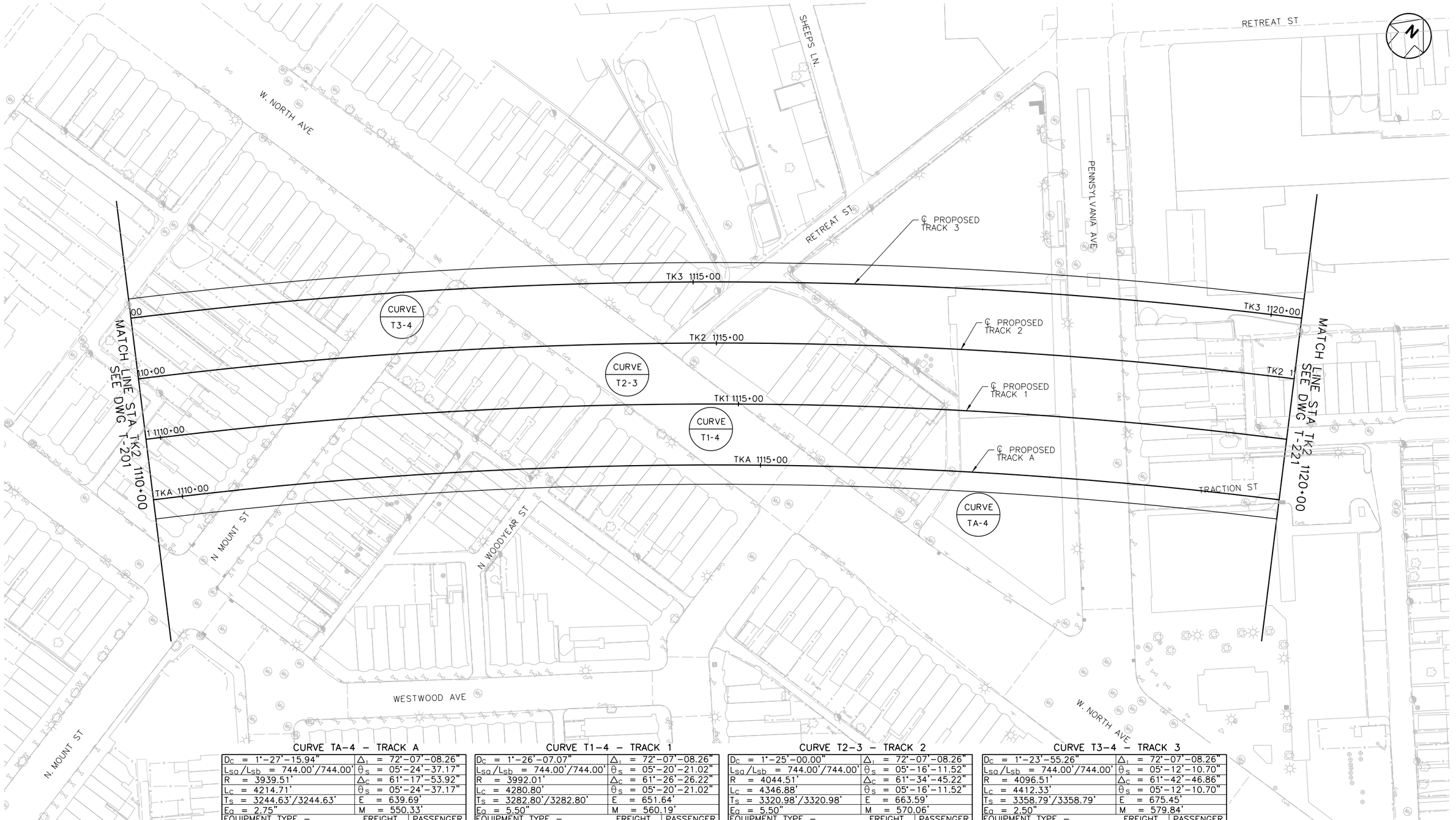
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

PROFILES – TRACK A & TRACK 1
STA. 1100+00 TO STA. 1110+00

Designed	Drawn	Checked	Date
DO	JB	FB	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-203



CURVE TA–4 – TRACK A

D_C = 1°–27'–15.94"		Δ_I = 72°–07'–08.26"	
L_{SA}/L_{SB} = 744.00'/744.00'		θ_S = 05°–24'–37.17"	
R = 3939.51'		Δ_C = 61°–17'–53.92"	
L_C = 4214.71'		θ_S = 05°–24'–37.17"	
T_S = 3244.63'/3244.63'		E = 639.69'	
E_Q = 2.75"		M = 550.33'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	–0.21"	3.76"
V_{MPH}	=	50	50
JERK RATE ENT	=	–72.49	2.47
JERK RATE EXT	=	–72.49	2.47

CURVE T1–4 – TRACK 1

D_C = 1°–26'–07.07"		Δ_I = 72°–07'–08.26"	
L_{SA}/L_{SB} = 744.00'/744.00'		θ_S = 05°–20'–21.02"	
R = 3992.01'		Δ_C = 61°–26'–26.22"	
L_C = 4280.80'		θ_S = 05°–20'–21.02"	
T_S = 3282.80'/3282.80'		E = 651.64'	
E_Q = 5.50"		M = 560.19'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	–2.99"	4.55"
V_{MPH}	=	50	100
JERK RATE ENT	=	–4.98	1.64
JERK RATE EXT	=	–4.98	1.64

CURVE T2–3 – TRACK 2

D_C = 1°–25'–00.00"		Δ_I = 72°–07'–08.26"	
L_{SA}/L_{SB} = 744.00'/744.00'		θ_S = 05°–16'–11.52"	
R = 4044.51'		Δ_C = 61°–34'–45.22"	
L_C = 4346.88'		θ_S = 05°–16'–11.52"	
T_S = 3320.98'/3320.98'		E = 663.59'	
E_Q = 5.50"		M = 570.06'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	–3.02"	4.41"
V_{MPH}	=	50	100
JERK RATE ENT	=	–4.92	1.69
JERK RATE EXT	=	–4.92	1.69

CURVE T3–4 – TRACK 3

D_C = 1°–23'–55.26"		Δ_I = 72°–07'–08.26"	
L_{SA}/L_{SB} = 744.00'/744.00'		θ_S = 05°–12'–10.70"	
R = 4096.51'		Δ_C = 61°–42'–46.86"	
L_C = 4412.33'		θ_S = 05°–12'–10.70"	
T_S = 3358.79'/3358.79'		E = 675.45'	
E_Q = 2.50"		M = 579.84'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	–0.05"	2.30"
V_{MPH}	=	50	50
JERK RATE ENT	=	–281.84	4.63
JERK RATE EXT	=	–281.84	4.63

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering
National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

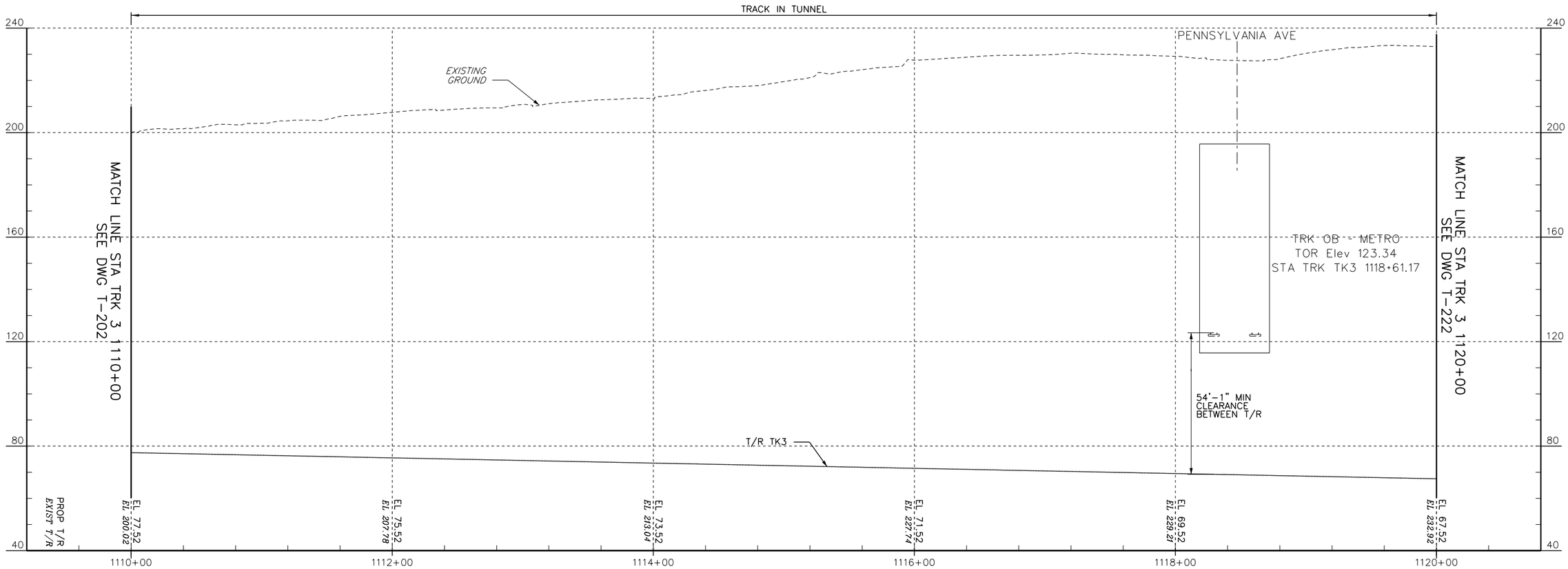
Approved Date
WORK IN PROGRESS

A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL
TRACK PLAN
STA TK2 1110+00 TO STA TK2 1120+00

Designed XXX	Drawn XXX	Checked XXX	Date 09/28/2016	

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T–211



PROFILE – TRACK 3

0 40 80
HORIZ. SCALE IN FEET

0 20 40
VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering
National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

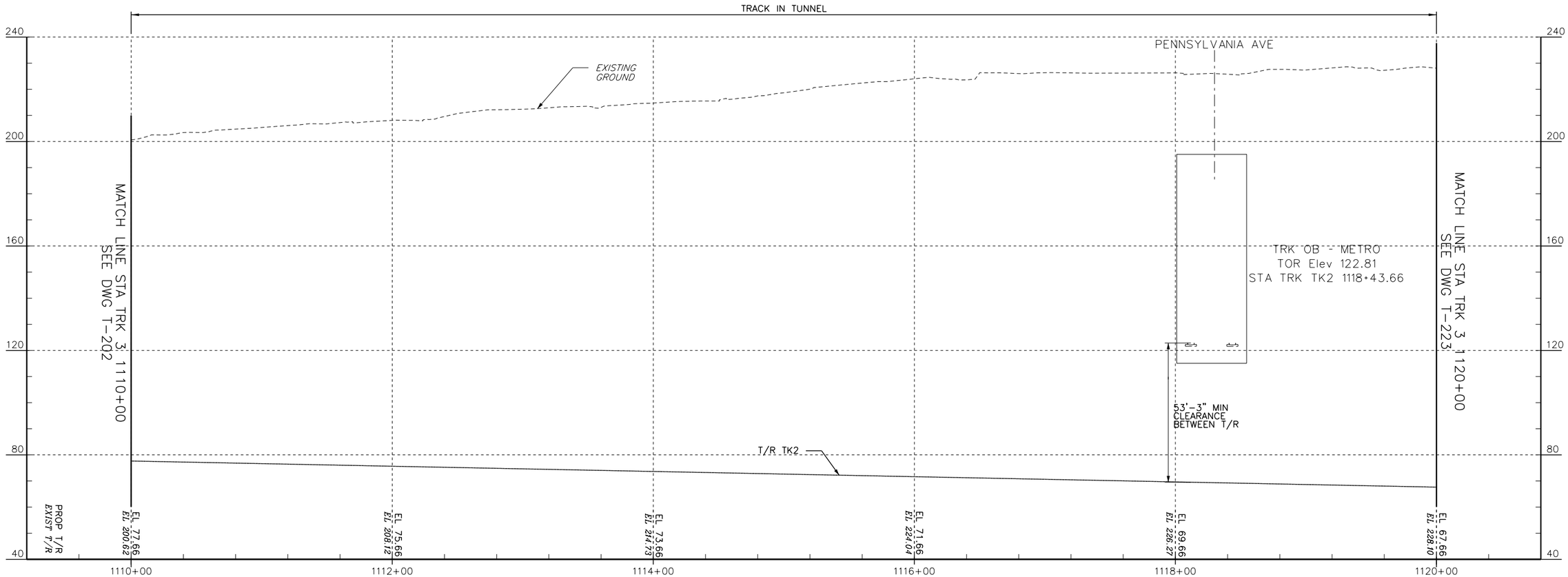
Approved | Date
WORK IN PROGRESS

A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL
PROFILE – TRACK 3
STA. 1110+00 TO STA. 1120+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T–212



PROFILE – TRACK 2

HORIZ. SCALE IN FEET 0 40 80

VERT. SCALE IN FEET 0 20 40

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

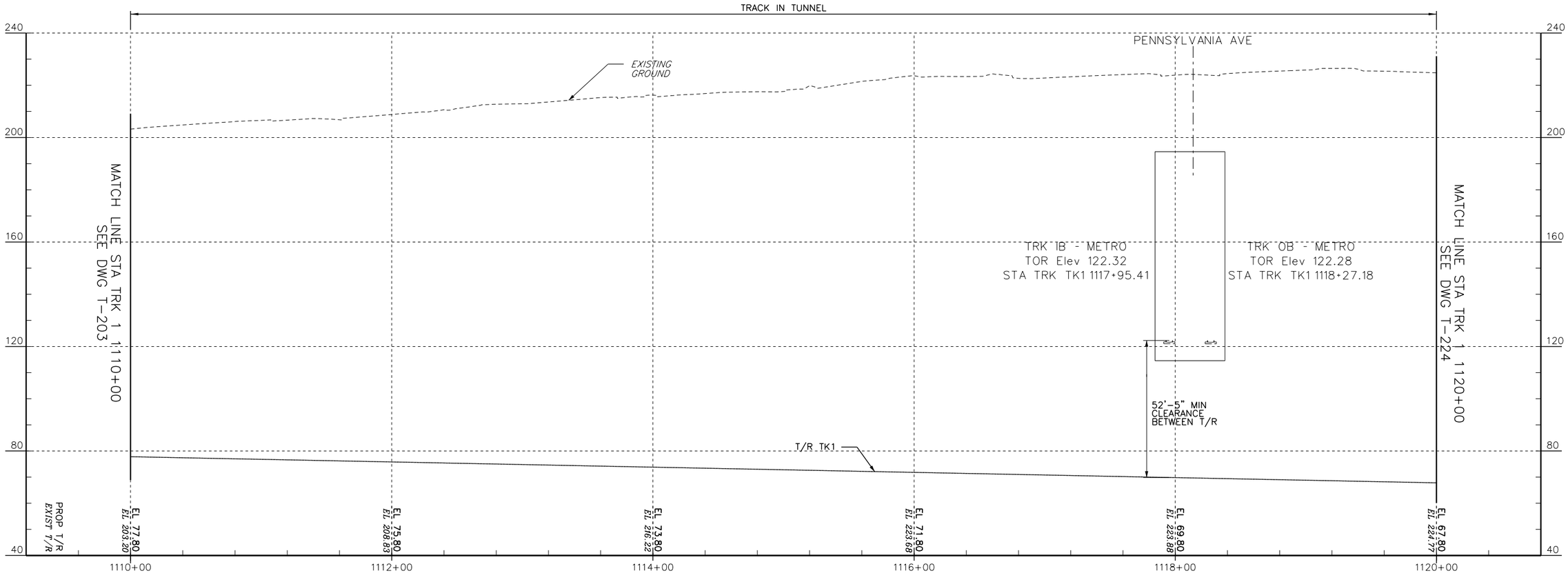
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

PROFILE – TRACK 2
STA. 1110+00 TO STA. 1120+00

Designed	Drawn	Checked	Date 09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-213



PROFILE – TRACK 1

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering
National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

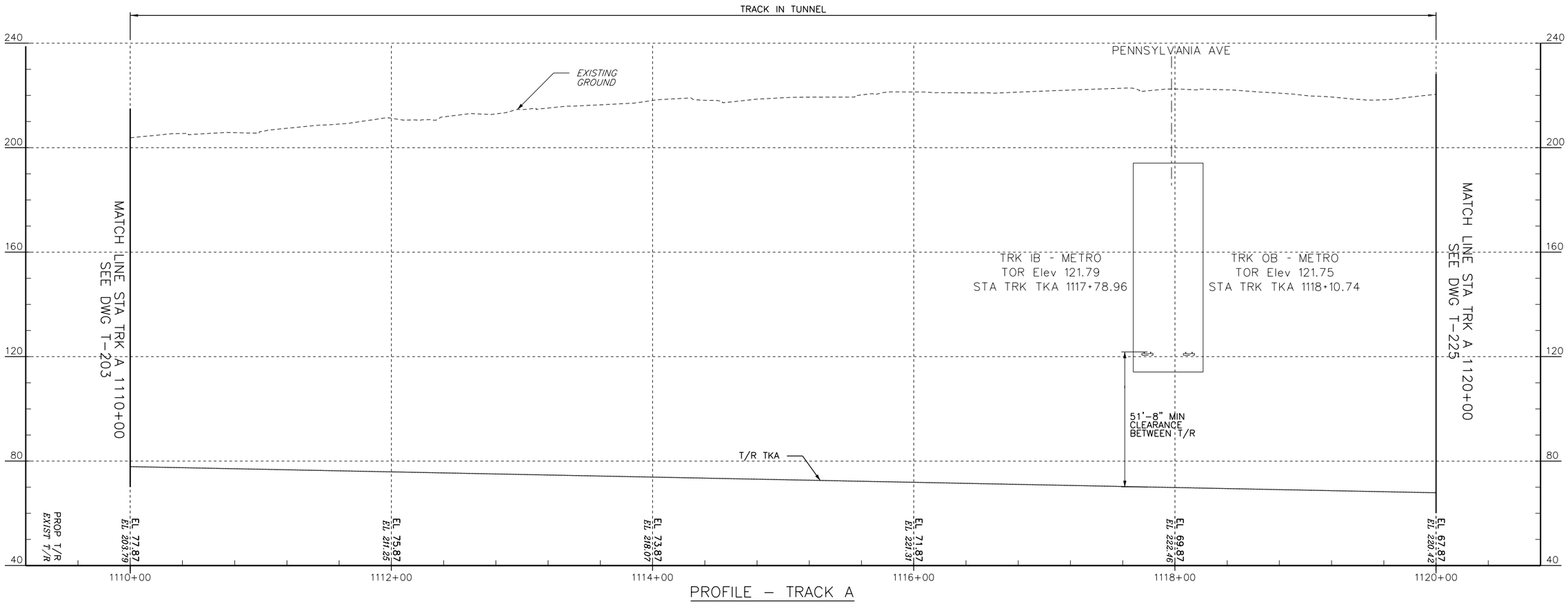
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

PROFILE – TRACK 1
STA. 1110+00 TO STA. 1120+00

Designed	Drawn	Checked	Date 09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-214



PROFILE – TRACK A

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

PROFILE – TRACK A
STA. 1110+00 TO STA. 1120+00

Designed	Drawn	Checked	Date 09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-215

RETREAT ST
WOODBROOK AVE
ETTING ST
FRANCIS ST
TRACTION ST
DRUID HILL AVE
WHITELOCK ST
STODDARD ALLEY
W. NORTH AVE
N

℄ PROPOSED TRACK 3
℄ PROPOSED TRACK 2
℄ PROPOSED TRACK 1
℄ PROPOSED TRACK A

TK3 1125+00
TK3 1130+00
TK2 1125+00
TK2 1
TK1 1125+00
TK1 1120+00
TKA 1125+00
TKA 1120+00
20+00

CURVE T3-4
CURVE T2-3
CURVE T1-4
CURVE TA-4

MATCH LINE STA TK2 1120+00 SEE DWG T-211
MATCH LINE STA TK2 1130+00 SEE DWG T-231

CURVE TA-4 – TRACK A

D_C = 1°-27'-15.94"	Δ_I = 72°-07'-08.26"		
L_{SC}/L_{SB} = 744.00'/744.00'	θ_S = 05°-24'-37.17"		
R = 3939.51'	Δ_C = 61°-17'-53.92"		
L_C = 4214.71'	θ_S = 05°-24'-37.17"		
T_S = 3244.63'/3244.63'	E = 639.69'		
E_Q = 2.75"	M = 550.33'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-0.21"	3.76"
V_{MPH}	=	50	50
JERK RATE ENT	=	-72.49	2.47
JERK RATE EXT	=	-72.49	2.47

CURVE T1-4 – TRACK 1

D_C = 1°-26'-07.07"	Δ_I = 72°-07'-08.26"		
L_{SC}/L_{SB} = 744.00'/744.00'	θ_S = 05°-20'-21.02"		
R = 3992.01'	Δ_C = 61°-26'-26.22"		
L_C = 4280.80'	θ_S = 05°-20'-21.02"		
T_S = 3282.80'/3282.80'	E = 651.64'		
E_Q = 5.50"	M = 560.19'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-2.99"	4.55"
V_{MPH}	=	50	100
JERK RATE ENT	=	-4.98	1.64
JERK RATE EXT	=	-4.98	1.64

CURVE T2-3 – TRACK 2

D_C = 1°-25'-00.00"	Δ_I = 72°-07'-08.26"		
L_{SC}/L_{SB} = 744.00'/744.00'	θ_S = 05°-16'-11.52"		
R = 4044.51'	Δ_C = 61°-34'-45.22"		
L_C = 4346.88'	θ_S = 05°-16'-11.52"		
T_S = 3320.98'/3320.98'	E = 663.59'		
E_Q = 5.50"	M = 570.06'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-3.02"	4.41"
V_{MPH}	=	50	100
JERK RATE ENT	=	-4.92	1.69
JERK RATE EXT	=	-4.92	1.69

CURVE T3-4 – TRACK 3

D_C = 1°-23'-55.26"	Δ_I = 72°-07'-08.26"		
L_{SC}/L_{SB} = 744.00'/744.00'	θ_S = 05°-12'-10.70"		
R = 4096.51'	Δ_C = 61°-42'-46.86"		
L_C = 4412.33'	θ_S = 05°-12'-10.70"		
T_S = 3358.79'/3358.79'	E = 675.45'		
E_Q = 2.50"	M = 579.84'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-0.05"	2.30"
V_{MPH}	=	50	50
JERK RATE ENT	=	-281.84	4.63
JERK RATE EXT	=	-281.84	4.63

0 20 40
SCALE IN FEET

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

No.	Revisions	Date	By

AMTRAK

Office of Engineering
National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

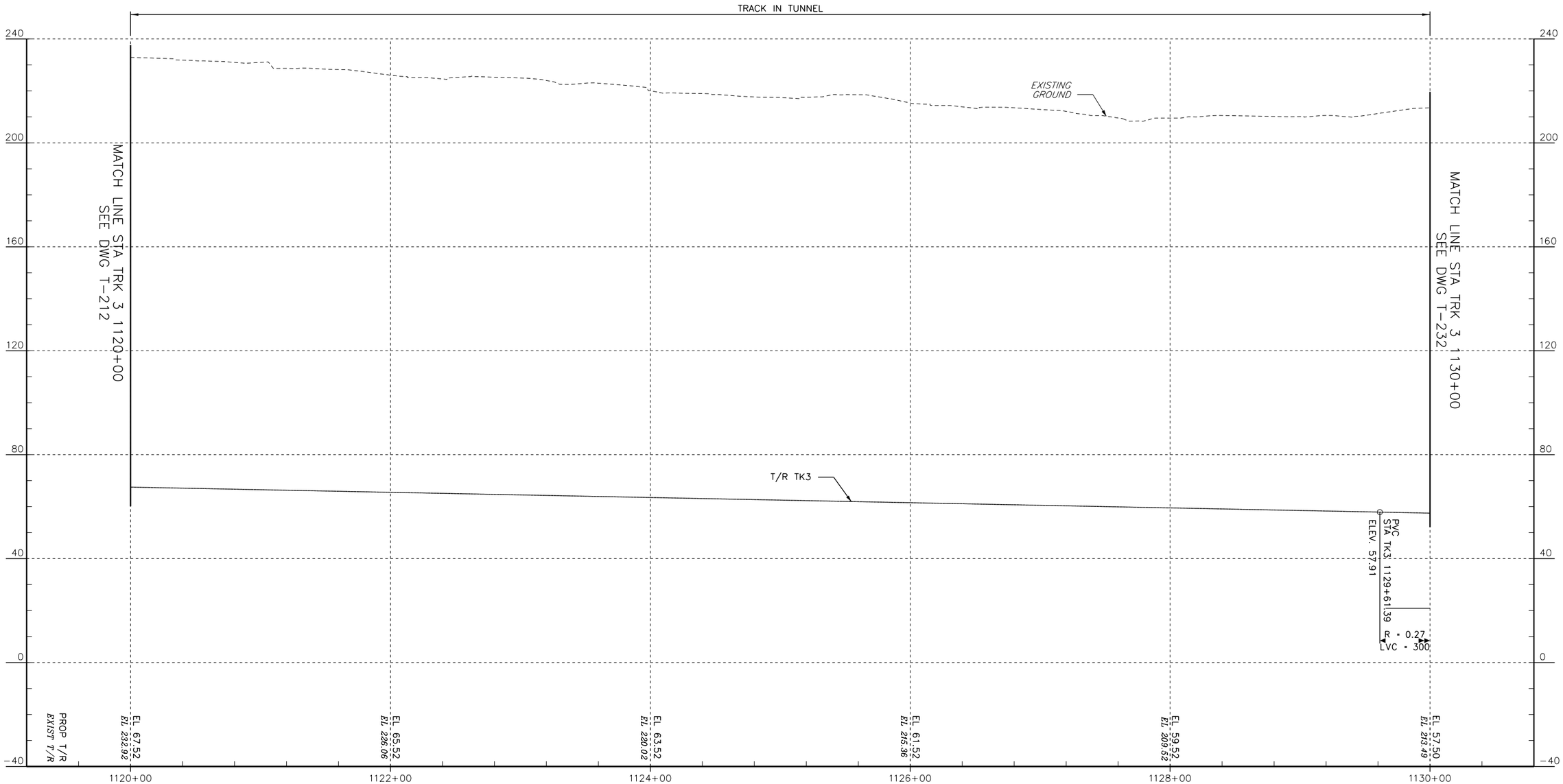
Approved | Date
WORK IN PROGRESS

A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL
TRACK PLAN
STA TK2 1120+00 TO STA TK2 1130+00

Designed	Drawn	Checked	Date 09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-221



PROFILE – TRACK 3

HORIZ. SCALE IN FEET 0 40 80

VERT. SCALE IN FEET 0 20 40

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering
National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

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A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
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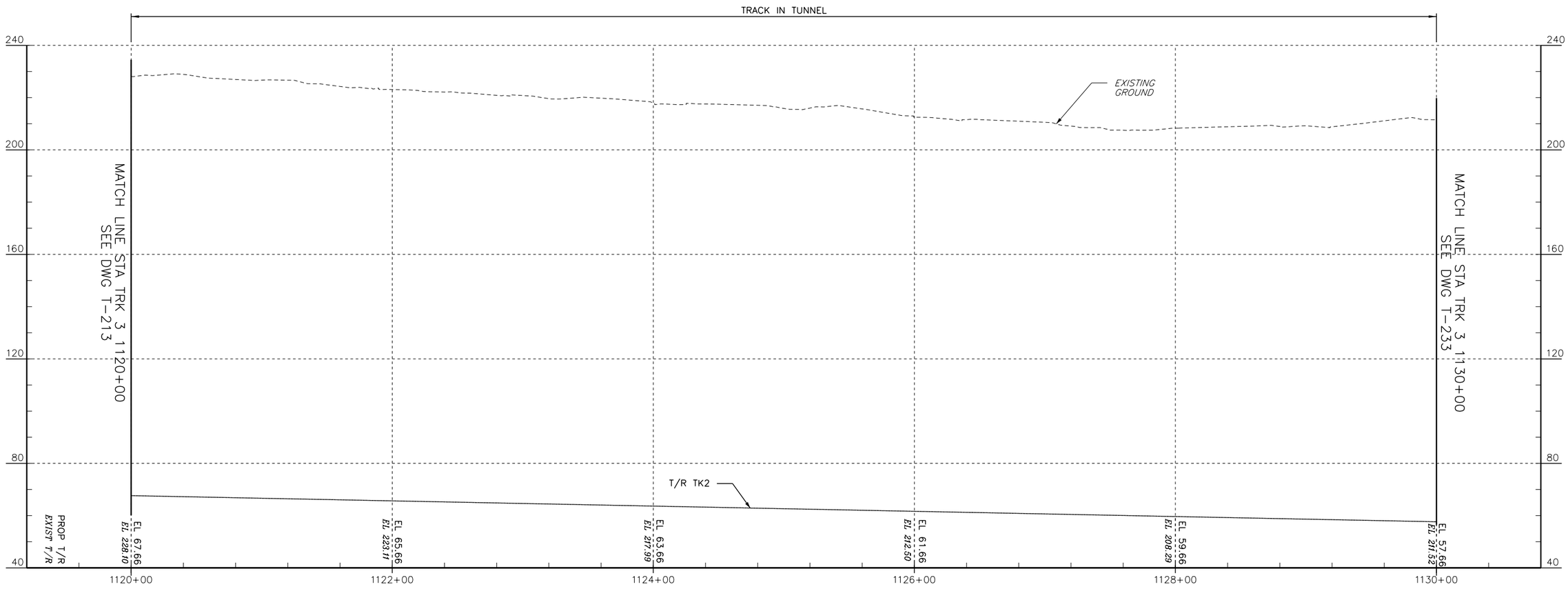
PROFILE – TRACK 3
STA. 1120+00 TO STA. 1130+00

Designed	Drawn	Checked	Date 09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-222



PROFILE – TRACK 2

0 40 80 HORIZ. SCALE IN FEET

0 20 40 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

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National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

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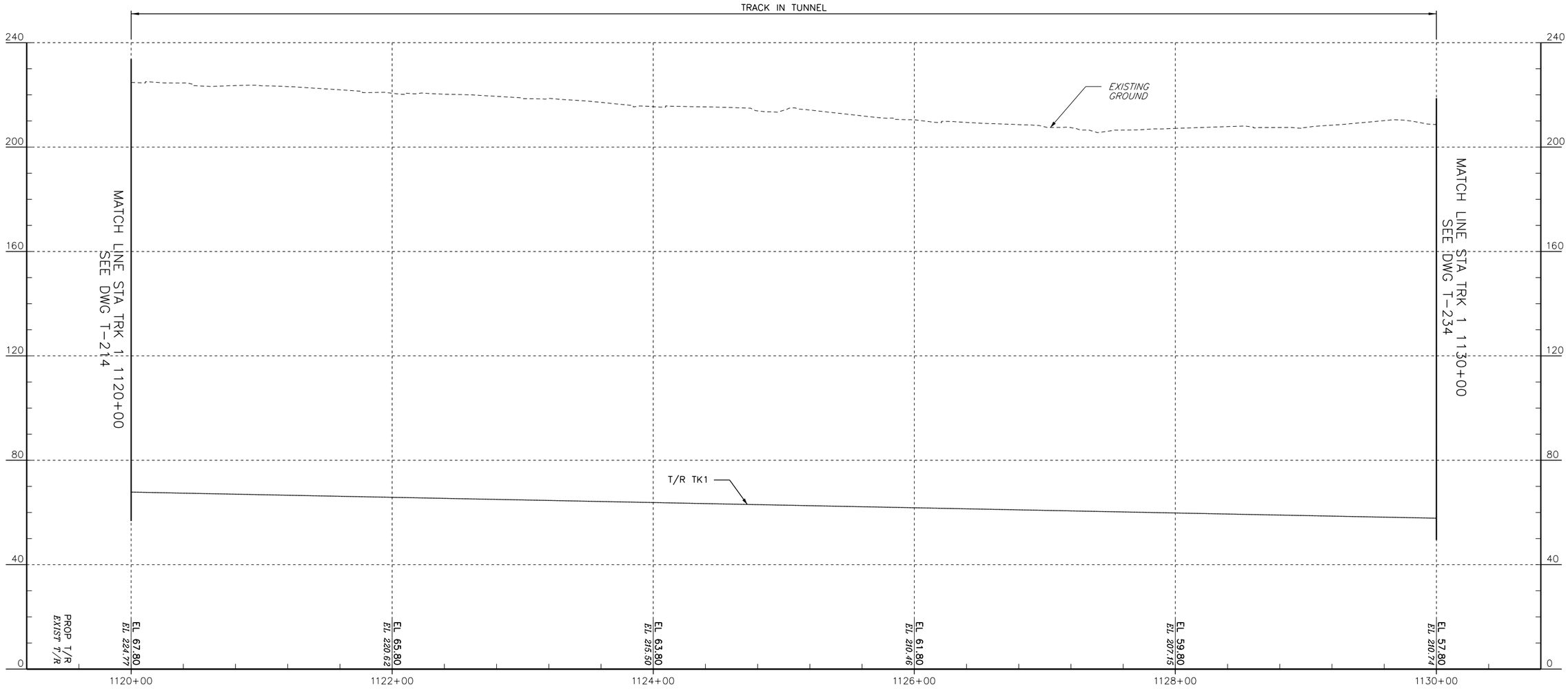
PROFILE – TRACK 2
STA. 1120+00 TO STA. 1130+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-223



PROFILE – TRACK 1

HORIZ. SCALE IN FEET 0 20 40

VERT. SCALE IN FEET 0 10 20

No.	Revisions	Date	By

$TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO
$DATE$

AMTRAK

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30th Street Station, Philadelphia, Pennsylvania 19104

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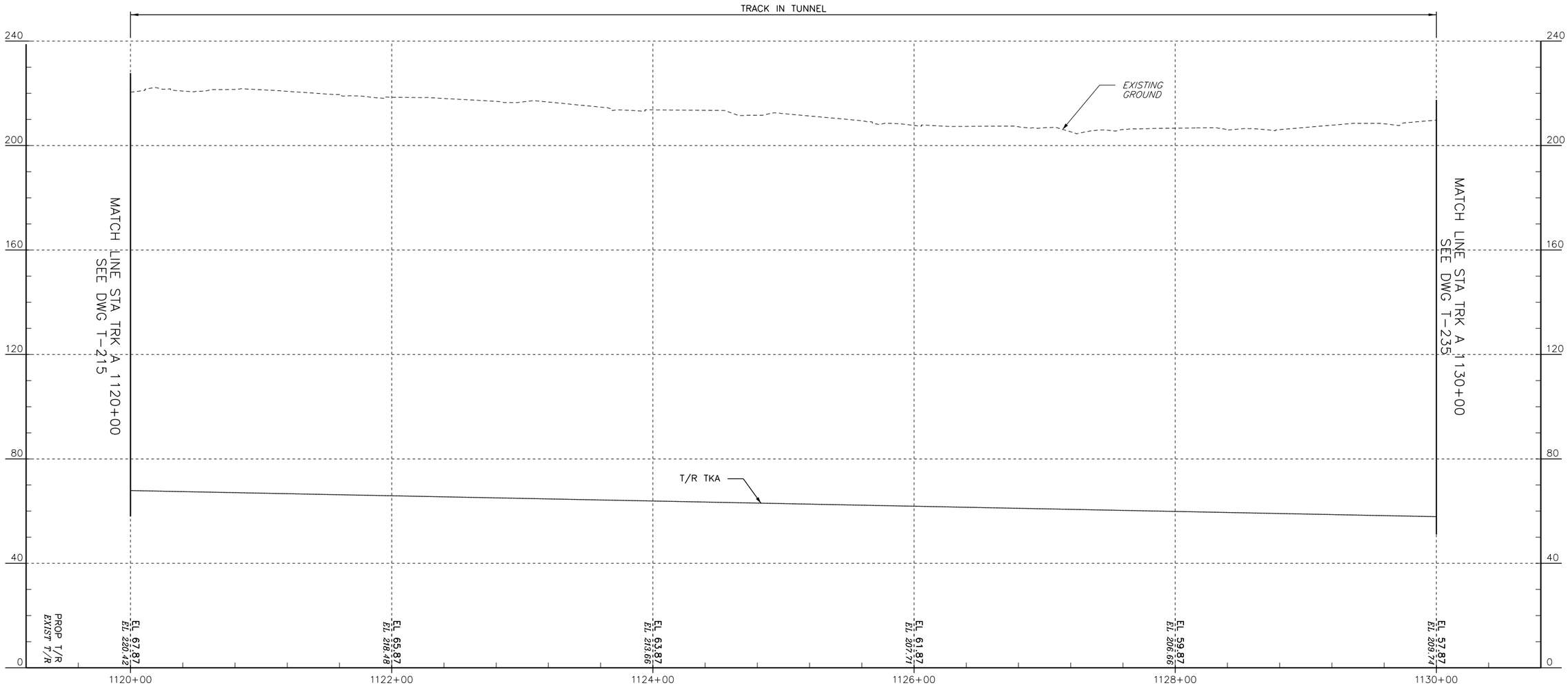
PROFILE – TRACK 1
STA. 1120+00 TO STA. 1130+00

Designed	Drawn	Checked	Date
DO	JB	FB	09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-224



PROFILE – TRACK A

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

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National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

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PROFILE – TRACK A
STA. 1120+00 TO STA. 1130+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T–225

CURVE TA–4 – TRACK A

D_C = 1°–27'–15.94"	Δ_1 = 72°–07'–08.26"		
L_{sa}/L_{sb} = 744.00'/7442.00'	θ_S = 05°–24'–37.17"		
R = 3939.51'	Δ_C = 61°–17'–53.92"		
L_C = 4214.71'	θ_S = 05°–24'–37.17"		
T_S = 3244.63'/3244.63'	E = 639.69'		
E_Q = 2.75"	M = 550.33'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	–0.21"	3.76"
V_{MPH}	=	50	50
JERK RATE ENT	=	–72.49	2.47
JERK RATE EXT	=	–72.49	2.47

CURVE T1–4 – TRACK 1

D_C = 1°–26'–07.07"	Δ_1 = 72°–07'–08.26"		
L_{sa}/L_{sb} = 744.00'/744.00'	θ_S = 05°–20'–21.02"		
R = 3992.01'	Δ_C = 61°–26'–26.22"		
L_C = 4280.80'	θ_S = 05°–20'–21.02"		
T_S = 3282.80'/3282.80'	E = 651.64'		
E_Q = 5.50"	M = 560.19'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	–2.99"	4.55"
V_{MPH}	=	50	100
JERK RATE ENT	=	–4.98	1.64
JERK RATE EXT	=	–4.98	1.64

CURVE T2–3 – TRACK 2

D_C = 1°–25'–00.00"	Δ_1 = 72°–07'–08.26"		
L_{sa}/L_{sb} = 744.00'/744.00'	θ_S = 05°–16'–11.52"		
R = 4044.51'	Δ_C = 61°–34'–45.22"		
L_C = 4346.88'	θ_S = 05°–16'–11.52"		
T_S = 3320.98'/3320.98'	E = 663.59'		
E_Q = 5.50"	M = 570.06'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	–3.02"	4.41"
V_{MPH}	=	50	100
JERK RATE ENT	=	–4.92	1.69
JERK RATE EXT	=	–4.92	1.69

CURVE T3–4 – TRACK 3

D_C = 1°–23'–55.26"	Δ_1 = 72°–07'–08.26"		
L_{sa}/L_{sb} = 744.00'/744.00'	θ_S = 05°–12'–10.70"		
R = 4096.51'	Δ_C = 61°–42'–46.86"		
L_C = 4412.33'	θ_S = 05°–12'–10.70"		
T_S = 3358.79'/3358.79'	E = 675.45'		
E_Q = 2.50"	M = 579.84'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	–0.05"	2.30"
V_{MPH}	=	50	50
JERK RATE ENT	=	–281.84	4.63
JERK RATE EXT	=	–281.84	4.63

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

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National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

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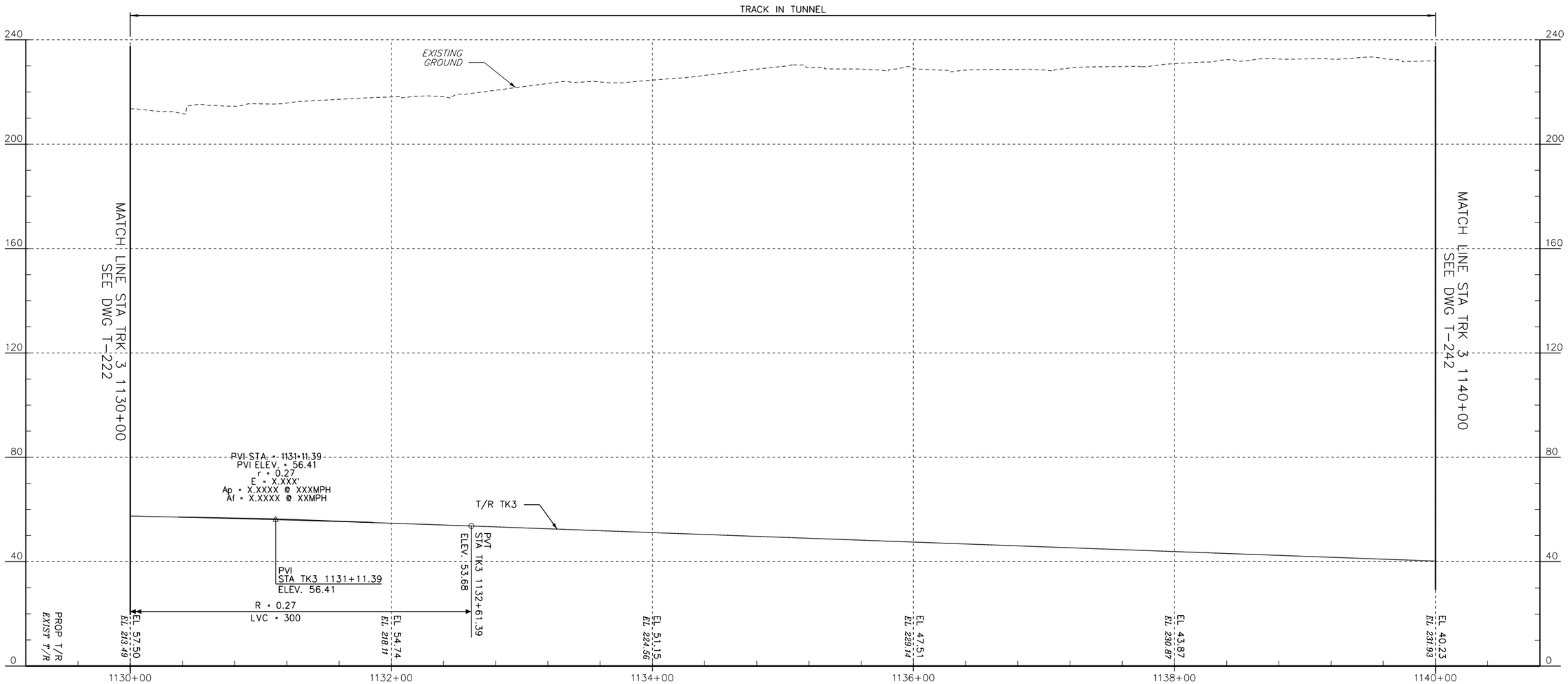
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

TRACK PLAN
STA TK2 1130+00 TO STA TK2 1140+00

Designed	Drawn	Checked	Date 09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T–231



PROFILE – TRACK 3

0 40 80
HORIZ. SCALE IN FEET

0 20 40
VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

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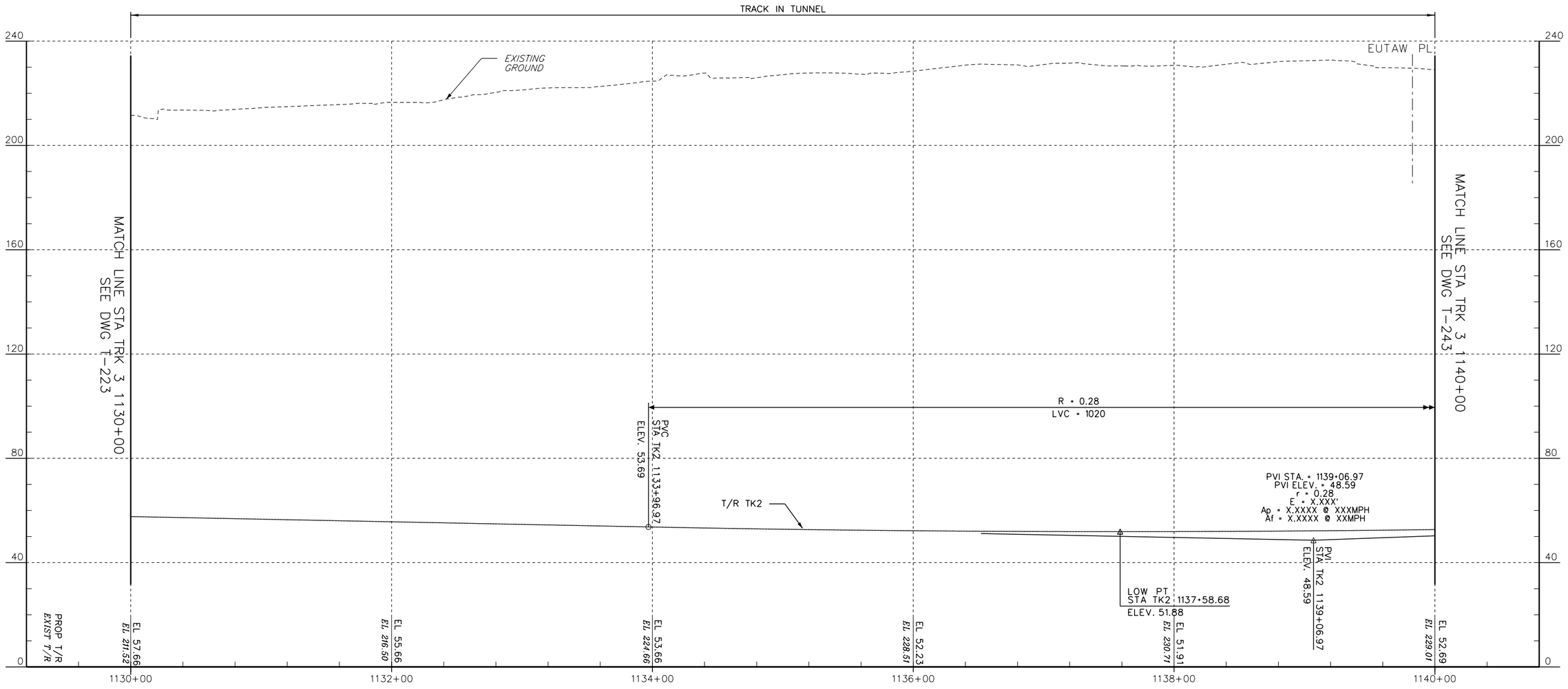
PROFILE – TRACK 3
STA. 1130+00 TO STA. 1140+00

Designed	Drawn	Checked	Date
DO	JB	FB	09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-232



PROFILE – TRACK 2

0 40 80
HORIZ. SCALE IN FEET

0 20 40
VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

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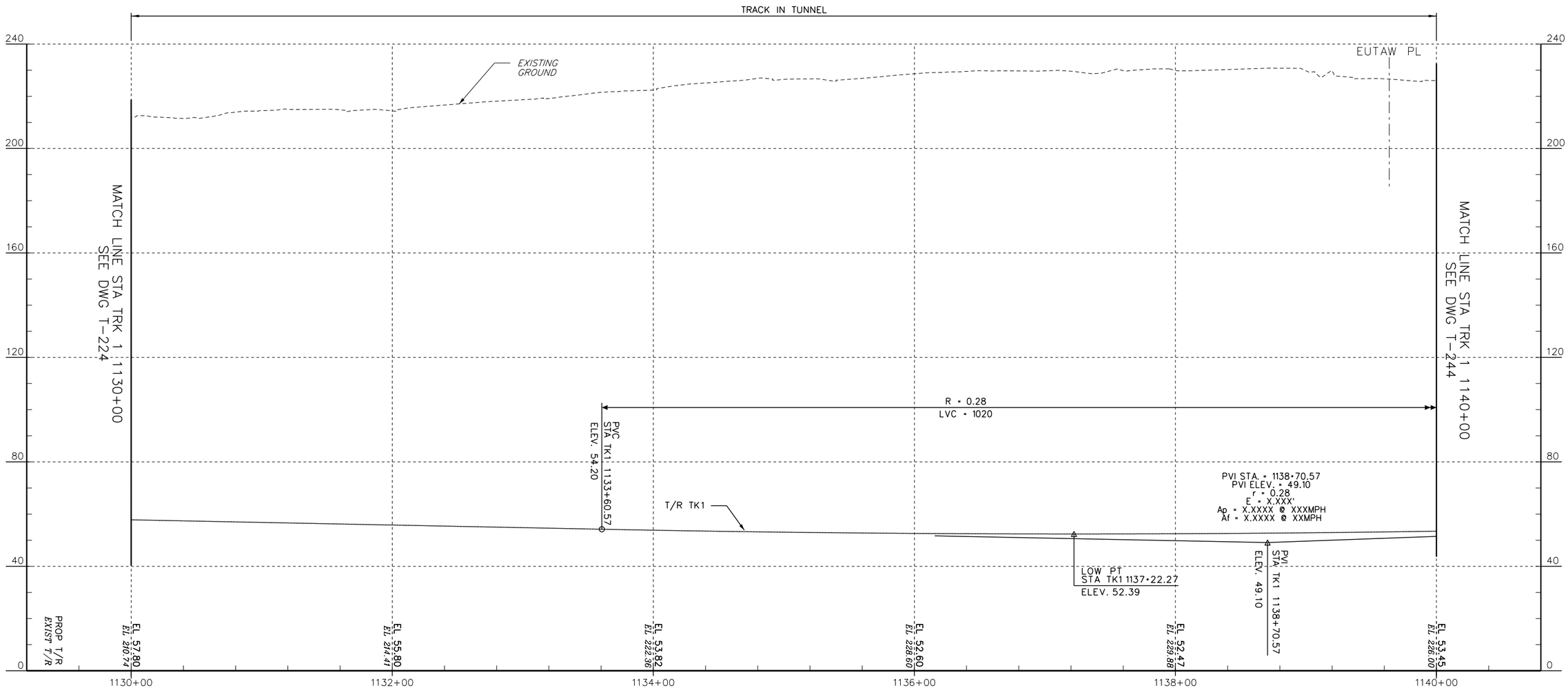
PROFILE – TRACK 2
STA. 1130+00 TO STA. 1140+00

Designed	Drawn	Checked	Date
DO	JB	FB	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-233



PROFILE – TRACK 1

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

No.	Revisions	Date	By

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30th Street Station, Philadelphia, Pennsylvania 19104

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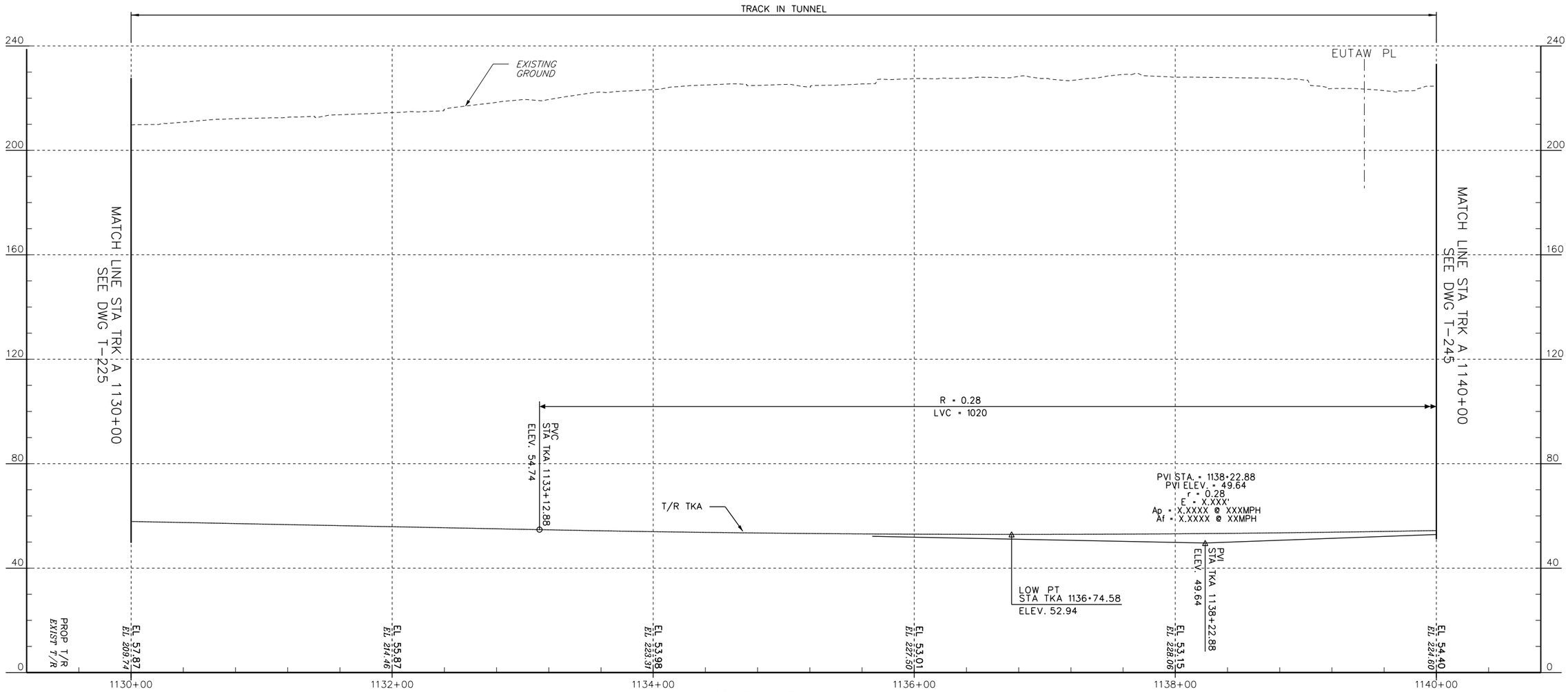
PROFILE – TRACK 1
STA. 1130+00 TO STA. 1140+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-234



PROFILE – TRACK A

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

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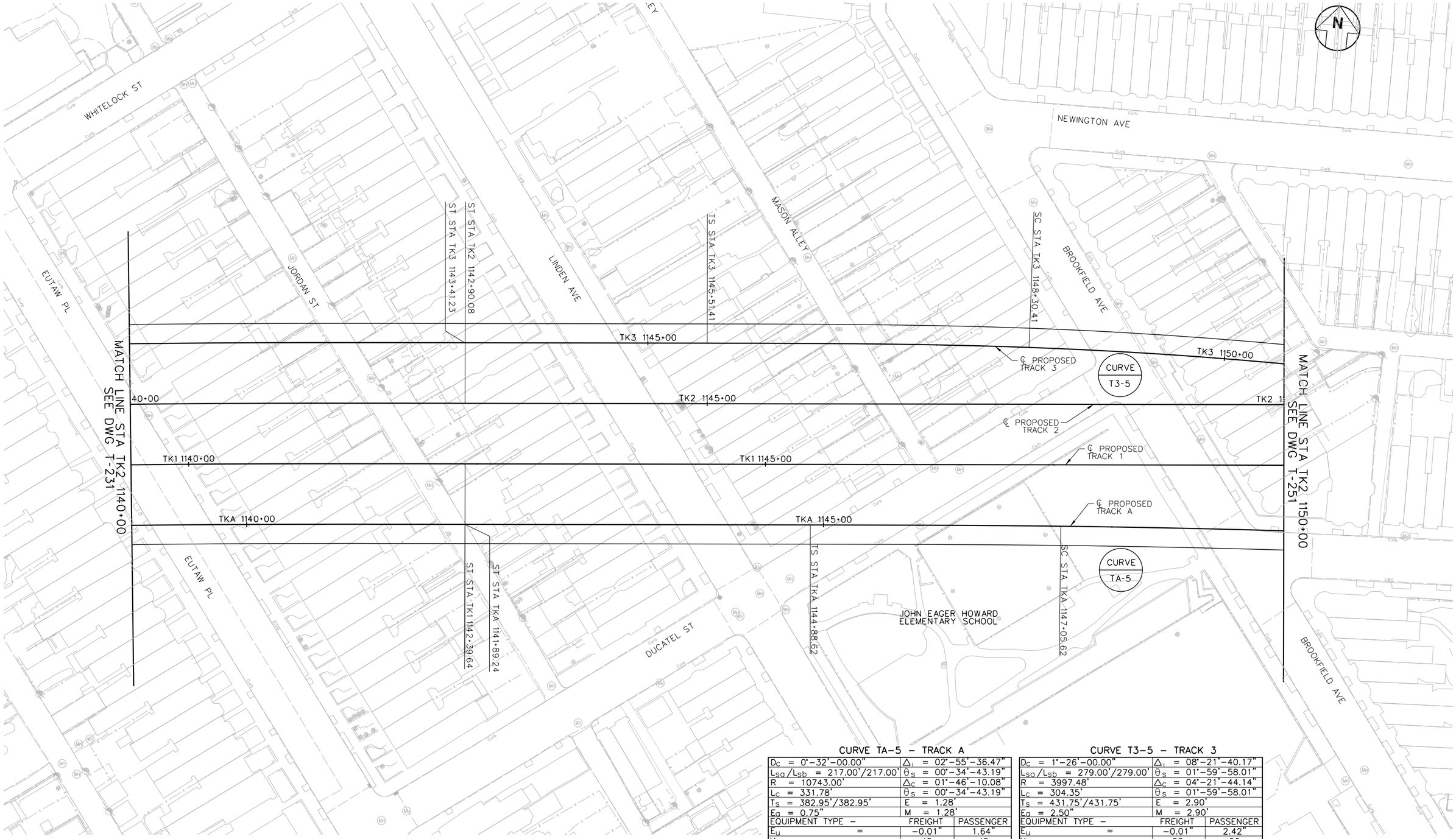
PROFILE – TRACK A
STA. 1130+00 TO STA. 1140+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-235



CURVE TA–5 – TRACK A

D_C = 0°–32'–00.00"		Δ_I = 02°–55'–36.47"	
L_{SC}/L_{SD} = 217.00'/217.00'		θ_S = 00°–34'–43.19"	
R = 10743.00'		Δ_C = 01°–46'–10.08"	
L_C = 331.78'		θ_S = 00°–34'–43.19"	
T_S = 382.95'/382.95'		E = 1.28'	
E_Q = 0.75"		M = 1.28'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	–0.01"	1.64"
V_{MPH}	=	45	45
JERK RATE ENT	=	822.28	1.66
JERK RATE EXT	=	822.28	1.66

CURVE T3–5 – TRACK 3

D_C = 1°–26'–00.00"		Δ_I = 08°–21'–40.17"	
L_{SC}/L_{SD} = 279.00'/279.00'		θ_S = 01°–59'–58.01"	
R = 3997.48'		Δ_C = 04°–21'–44.14"	
L_C = 304.35'		θ_S = 01°–59'–58.01"	
T_S = 431.75'/431.75'		E = 2.90'	
E_Q = 2.50"		M = 2.90'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	–0.01"	2.42"
V_{MPH}	=	50	50
JERK RATE ENT	=	712.89	1.65
JERK RATE EXT	=	712.89	1.65

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

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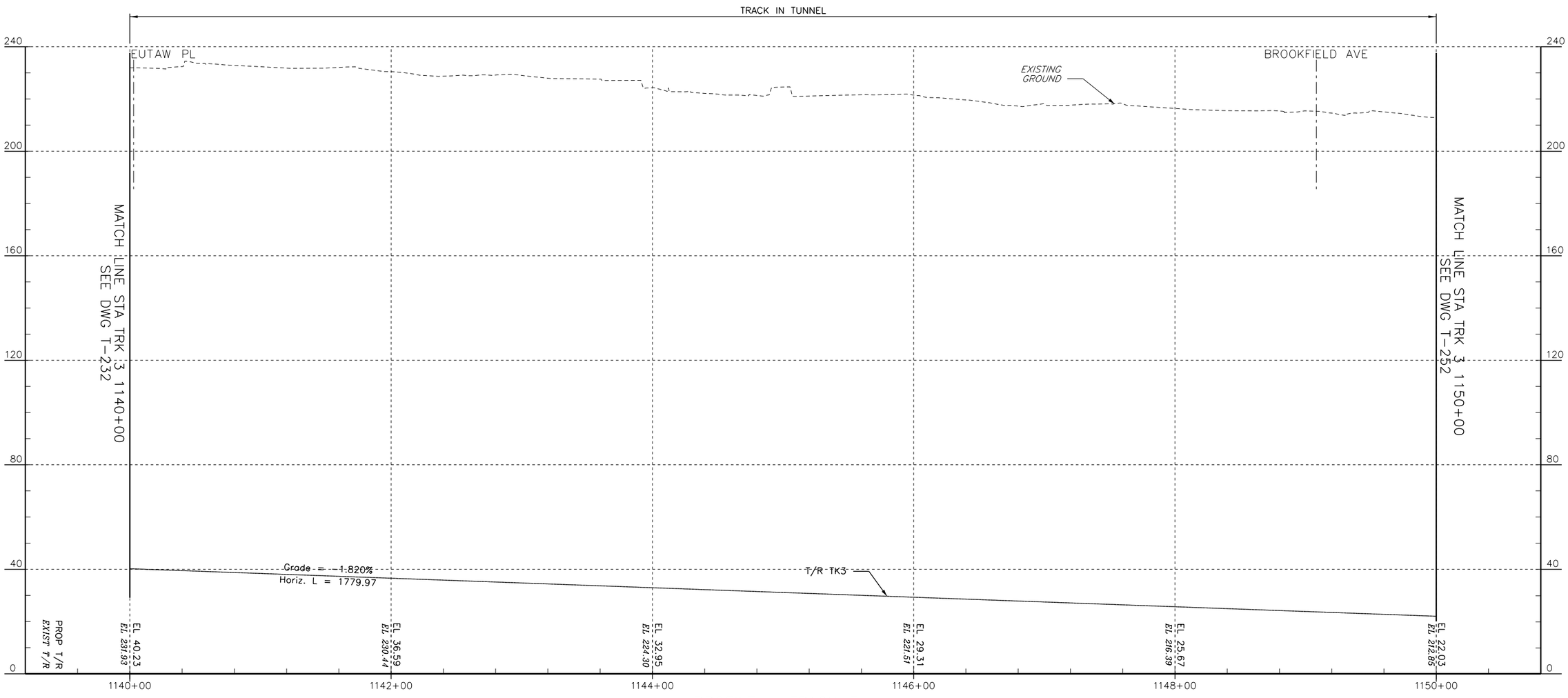
B&P TUNNEL

TRACK PLAN
STA TK2 1140+00 TO STA TK2 1150+00

Designed	Drawn	Checked	Date 09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T–241



PROFILE – TRACK 3

0 40 80
HORIZ. SCALE IN FEET

0 20 40
VERT. SCALE IN FEET

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

No.	Revisions	Date	By

AMTRAK

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PROFILE – TRACK 3
STA. 1140+00 TO STA. 1150+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
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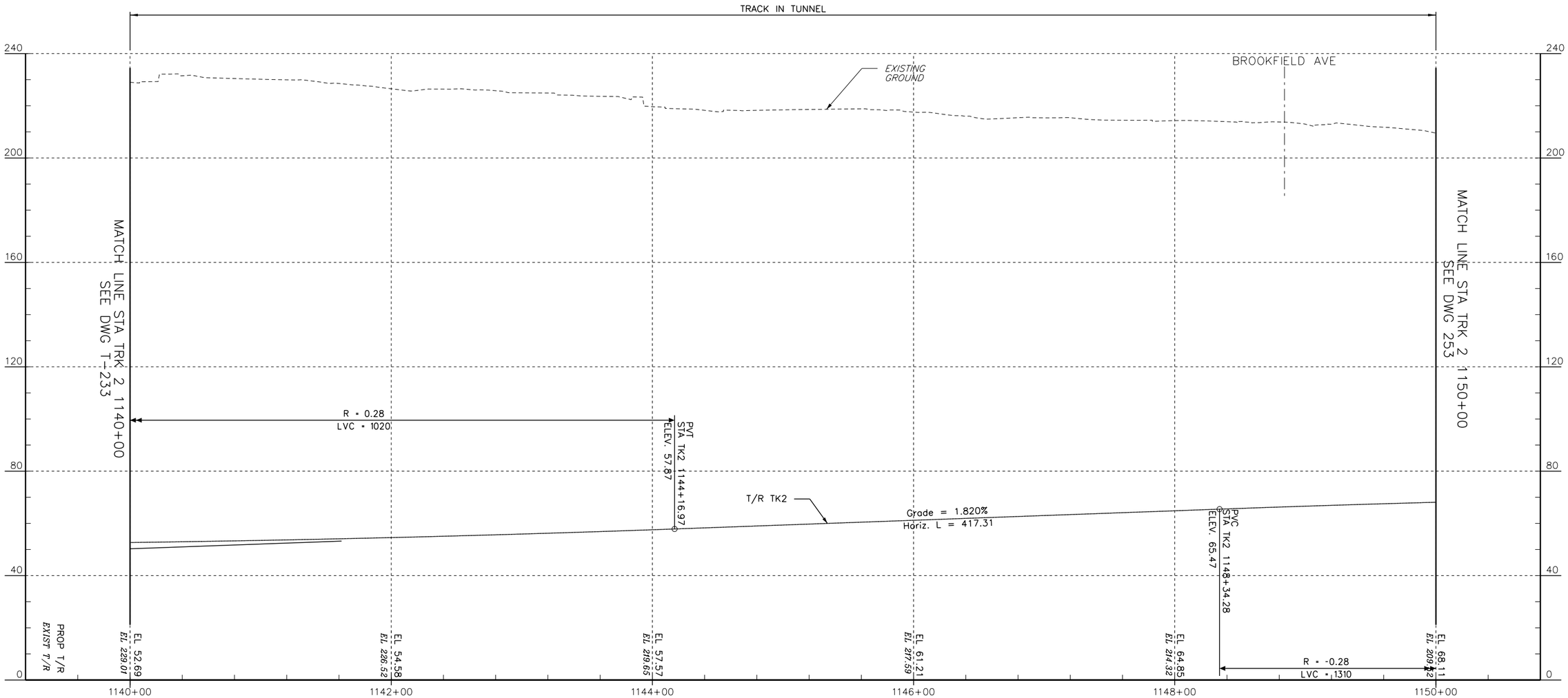
Dwg. No.	T-242



PROFILE – TRACK 2

0 40 80 HORIZ. SCALE IN FEET

0 20 40 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

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30th Street Station, Philadelphia, Pennsylvania 19104

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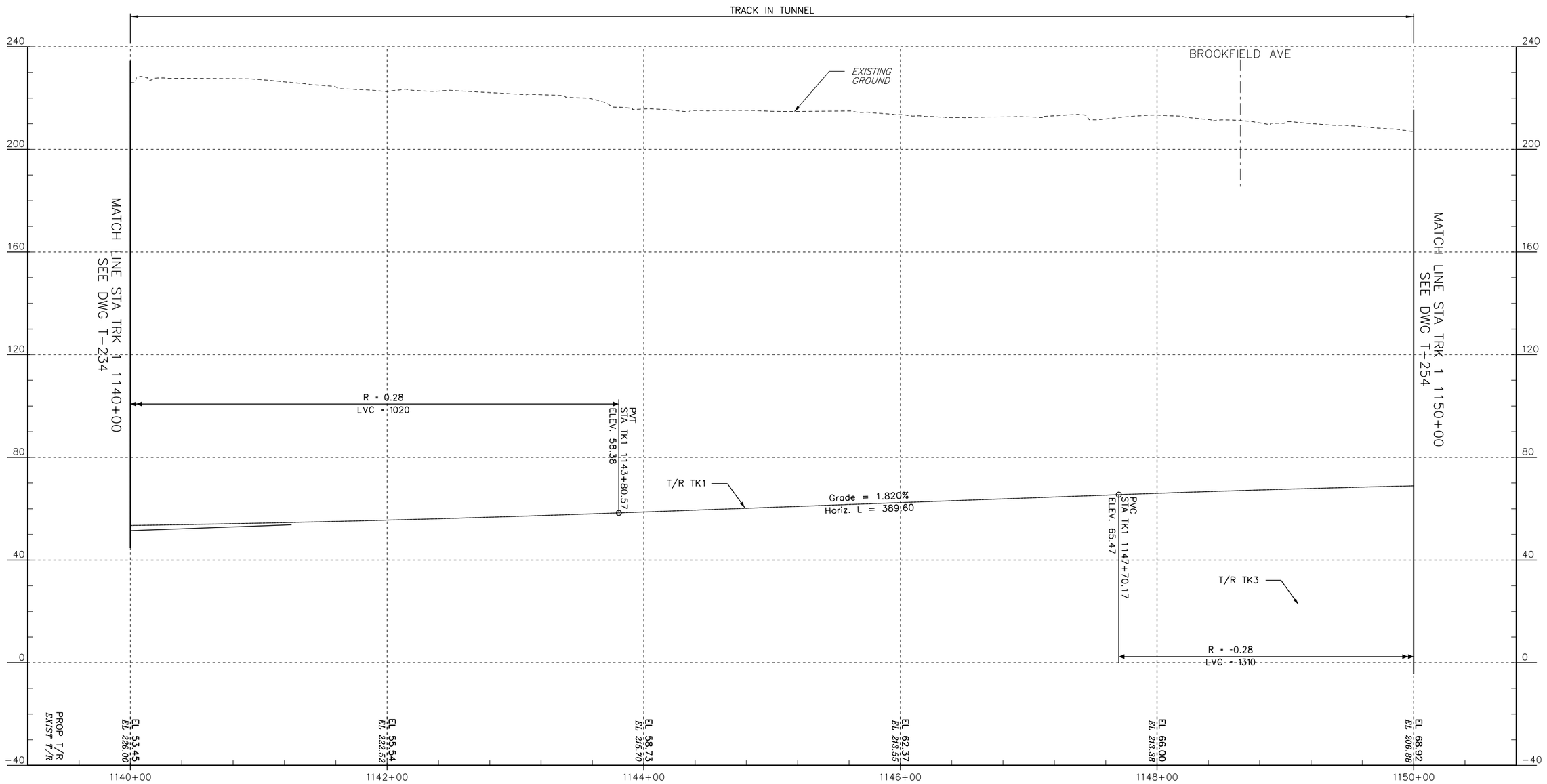
B&P TUNNEL

PROFILE – TRACK 2
STA. 1140+00 TO STA. 1150+00

Designed	Drawn	Checked	Date
DO	JB	FB	09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-243



PROFILE – TRACK 1

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering
National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

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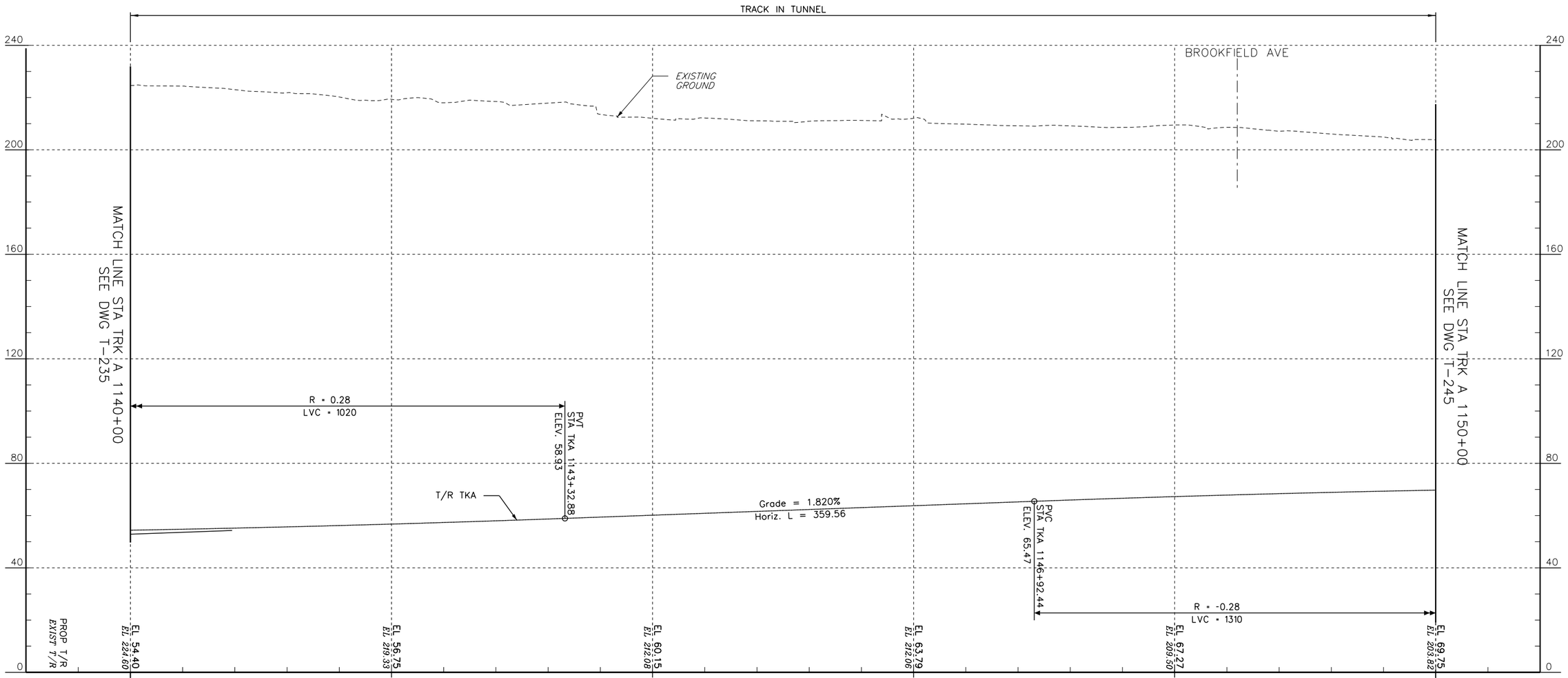
BALTIMORE, MD MPXX
B&P TUNNEL
PROFILE – TRACK 1
STA. 1140+00 TO STA. 1150+00

Designed	Drawn	Checked	Date
DO	JB	FB	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-244



PROFILE – TRACK A

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

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BALTIMORE, MD MPXX
B&P TUNNEL

PROFILE – TRACK A
STA. 1140+00 TO STA. 1150+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-245

CURVE TA-5 – TRACK A

D_C = 0°-32'-00.00"		Δ_I = 02°-55'-36.47"	
L_{SC}/L_{SB} = 217.00'/217.00'		θ_S = 00°-34'-43.19"	
R = 10743.00'		Δ_C = 01°-46'-10.08"	
L_C = 331.78'		θ_S = 00°-34'-43.19"	
T_S = 382.95'/382.95'		E = 1.28'	
E_Q = 0.75"		M = 1.28'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-0.01"	1.64"
V_{MPH}	=	45	45
JERK RATE ENT	=	822.28	1.66
JERK RATE EXT	=	822.28	1.66

CURVE TA-6 – TRACK A

D_C = 0°-32'-00.00"		Δ_I = 02°-55'-36.47"	
L_{SC}/L_{SB} = 217.00'/217.00'		θ_S = 00°-34'-43.19"	
R = 10743.00'		Δ_C = 01°-46'-10.08"	
L_C = 331.78'		θ_S = 00°-34'-43.19"	
T_S = 382.95'/382.95'		E = 1.28'	
E_Q = 0.75"		M = 1.28'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-0.01"	1.64"
V_{MPH}	=	45	45
JERK RATE ENT	=	822.28	1.66
JERK RATE EXT	=	822.28	1.66

CURVE T3-5 – TRACK 3

D_C = 1°-26'-00.00"		Δ_I = 08°-21'-40.17"	
L_{SC}/L_{SB} = 279.00'/279.00'		θ_S = 01°-59'-58.01"	
R = 3997.48'		Δ_C = 04°-21'-44.14"	
L_C = 304.35'		θ_S = 01°-59'-58.01"	
T_S = 431.75'/431.75'		E = 2.90'	
E_Q = 2.50"		M = 2.90'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-0.01"	2.42"
V_{MPH}	=	50	50
JERK RATE ENT	=	712.89	1.65
JERK RATE EXT	=	712.89	1.65

CURVE T3-6 – TRACK 3

D_C = 1°-26'-00.00"		Δ_I = 08°-21'-40.17"	
L_{SC}/L_{SB} = 279.00'/279.00'		θ_S = 01°-59'-58.01"	
R = 3997.48'		Δ_C = 04°-21'-44.14"	
L_C = 304.35'		θ_S = 01°-59'-58.01"	
T_S = 431.75'/431.75'		E = 2.90'	
E_Q = 2.50"		M = 2.90'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-0.01"	2.42"
V_{MPH}	=	50	50
JERK RATE ENT	=	712.89	1.65
JERK RATE EXT	=	712.89	1.65

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

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30th Street Station, Philadelphia, Pennsylvania 19104

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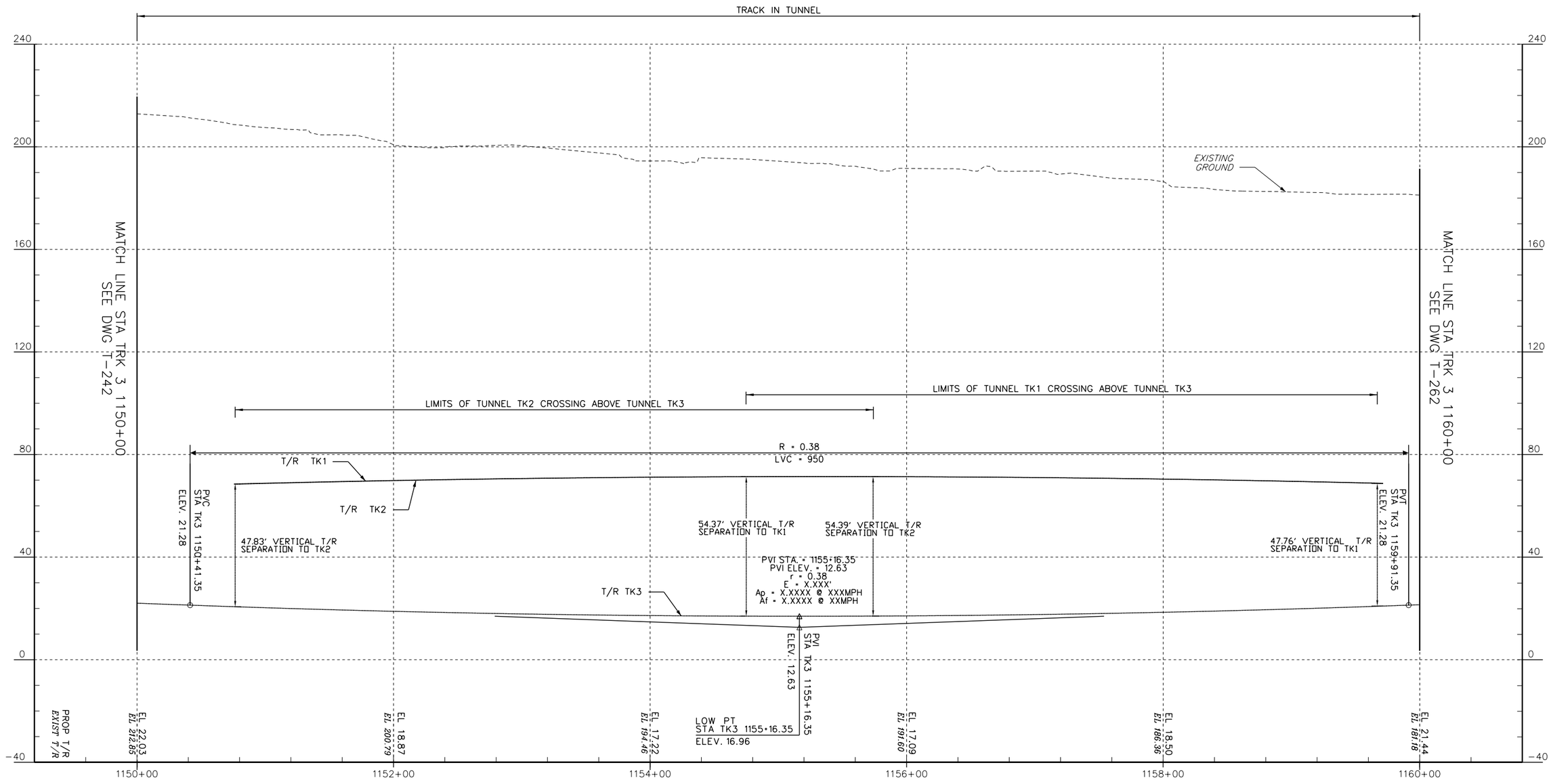
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

TRACK PLAN
STA TK2 1150+00 TO STA TK2 1160+00

Designed	Drawn	Checked	Date 09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-251



PROFILE – TRACK 3

0 40 80 HORIZ. SCALE IN FEET

0 20 40 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

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National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved | Date

WORK IN PROGRESS

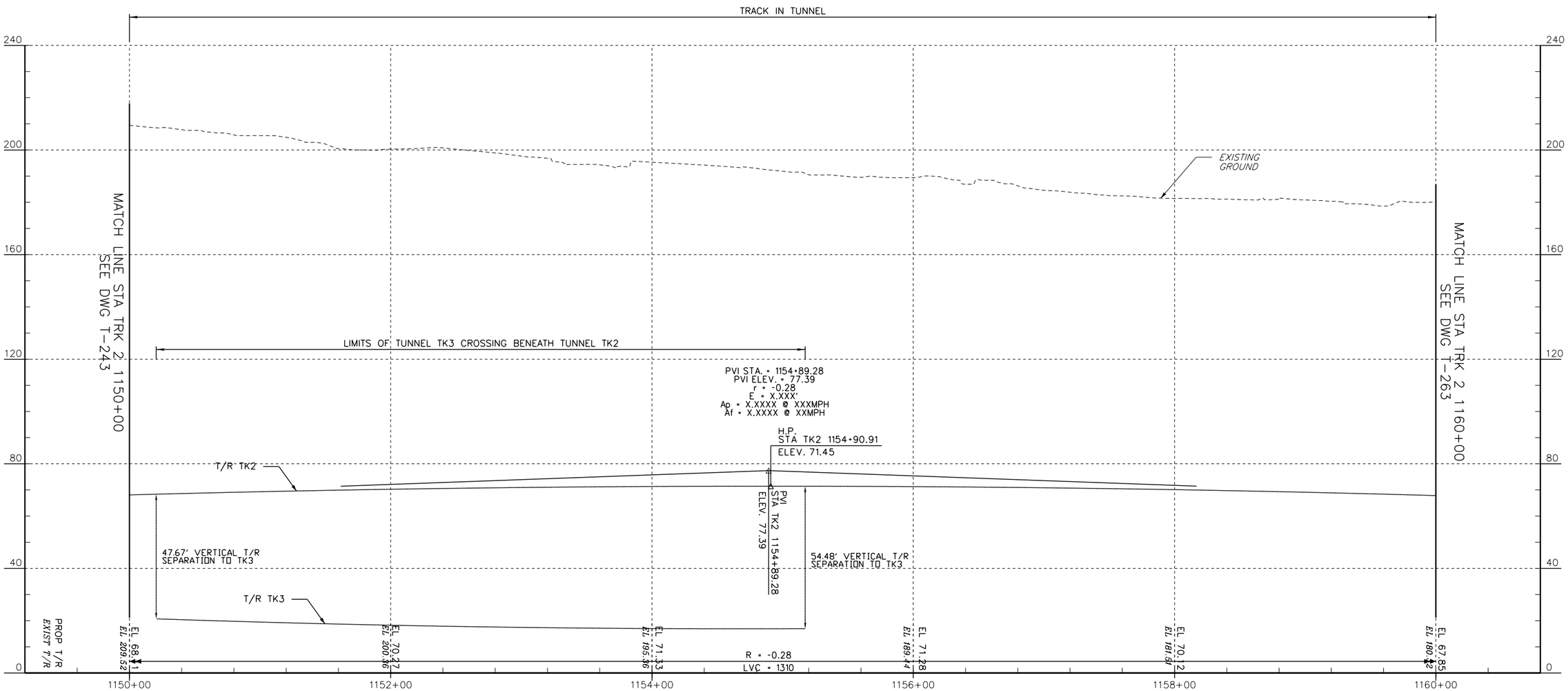
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

PROFILE – TRACK 3
STA. 1150+00 TO STA. 1160+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-252



PROFILE – TRACK 2

HORIZ. SCALE IN FEET 0 40 80

VERT. SCALE IN FEET 0 20 40

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved | Date

WORK IN PROGRESS

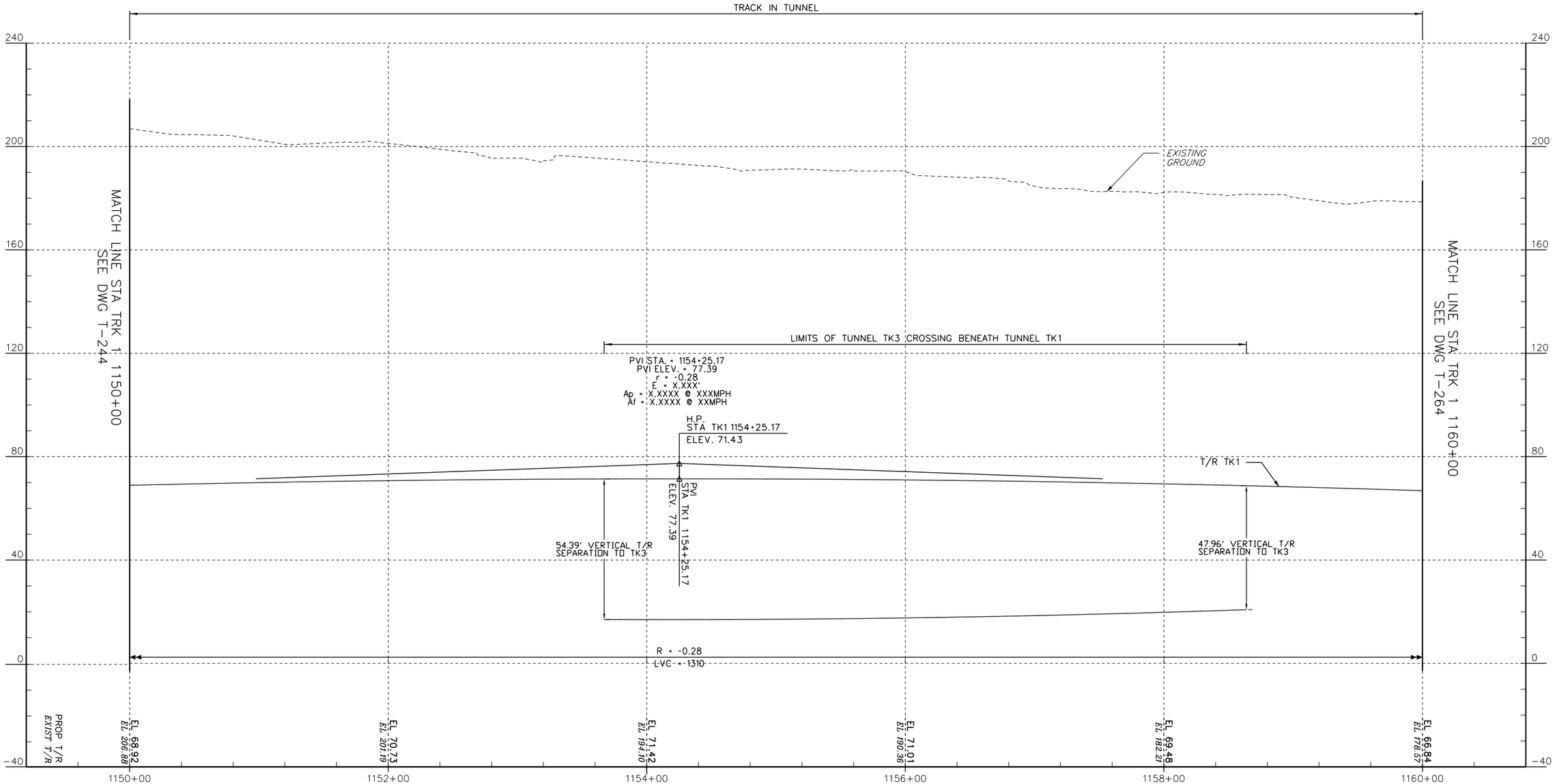
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

PROFILE – TRACK 2
STA. 1150+00 TO STA. 1160+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-253



PROFILE – TRACK 1

HORIZ. SCALE IN FEET 0 20 40

VERT. SCALE IN FEET 0 10 20

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

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WORK IN PROGRESS

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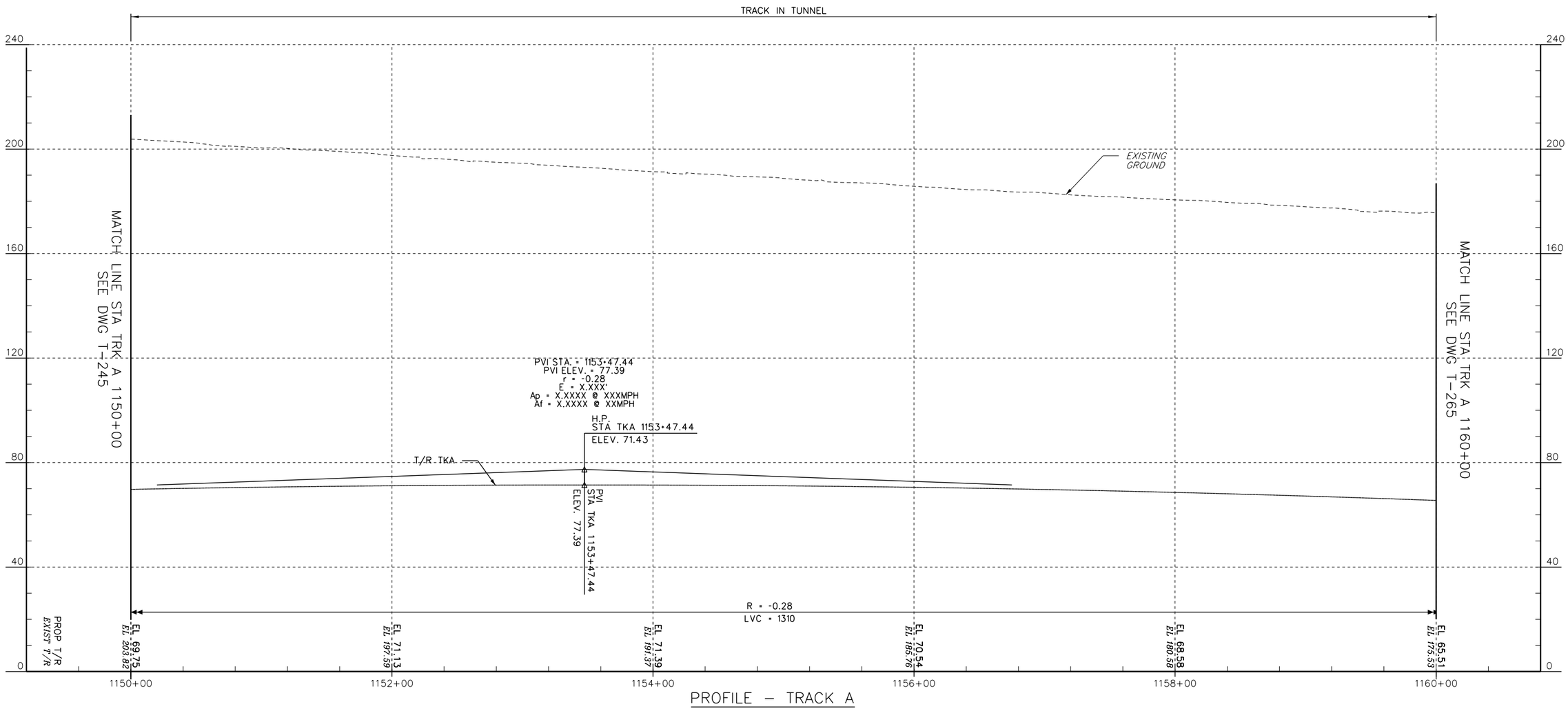
PROFILE – TRACK 1
STA. 1150+00 TO STA. 1160+00

Designed DO | Drawn JB | Checked FB | Date 09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-254



PROFILE – TRACK A

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

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PROFILE – TRACK A
STA. 1150+00 TO STA. 1160+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-255

CURVE TA-6 – TRACK A

D_C = 0°-32'-00.00"		Δ_I = 02°-55'-36.47"	
L_{SA}/L_{SB} = 217.00'/217.00'		θ_S = 00°-34'-43.19"	
R = 10743.00'		Δ_C = 01°-46'-10.08"	
L_C = 331.78'		θ_S = 00°-34'-43.19"	
T_S = 382.95'/382.95'		E = 1.28'	
E_Q = 0.75"		M = 1.28'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-0.01"	1.64"
V_{MPH}	=	45	80
JERK RATE ENT	=	822.28	1.66
JERK RATE EXT	=	822.28	1.66

CURVE TA-7 – TRACK A

D_C = 3°-45'-00.00"		Δ_I = 52°-52'-56.61"	
L_{SA}/L_{SB} = 248.00'/744.00'		θ_S = 04°-38'-57.01"	
R = 1528.16'		Δ_C = 34°-17'-08.56"	
L_C = 914.45'		θ_S = 13°-56'-51.04"	
T_S = 901.55'/1121.93'		E = 71.05'	
E_Q = 4.00"		M = 67.89'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	0.20"	2.56"
V_{MPH}	=	40	50
JERK RATE ENT	=	31.23	1.94
JERK RATE EXT	=	93.70	5.81

CURVE T1-5 – TRACK 1

D_C = 4°-20'-00.00"		Δ_I = 52°-52'-56.61"	
L_{SA}/L_{SB} = 341.00'/341.00'		θ_S = 07°-23'-11.66"	
R = 1322.53'		Δ_C = 38°-06'-33.29"	
L_C = 879.65'		θ_S = 07°-23'-11.66"	
T_S = 829.92'/829.92'		E = 76.66'	
E_Q = 5.50"		M = 72.46'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-0.65"	3.67"
V_{MPH}	=	40	55
JERK RATE ENT	=	-13.14	1.69
JERK RATE EXT	=	-13.14	1.69

CURVE T3-6 – TRACK 3

D_C = 1°-26'-00.00"		Δ_I = 08°-21'-40.17"	
L_{SA}/L_{SB} = 279.00'/279.00'		θ_S = 01°-59'-58.01"	
R = 3997.48'		Δ_C = 04°-21'-44.14"	
L_C = 304.35'		θ_S = 01°-59'-58.01"	
T_S = 431.75'/431.75'		E = 2.90'	
E_Q = 2.50"		M = 2.90'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-0.01"	2.42"
V_{MPH}	=	50	50
JERK RATE ENT	=	712.89	1.65
JERK RATE EXT	=	712.89	1.65

CURVE T3-7 – TRACK 3

D_C = 3°-54'-00.00"		Δ_I = 52°-52'-56.61"	
L_{SA}/L_{SB} = 248.00'/248.00'		θ_S = 04°-50'-06.24"	
R = 1469.41'		Δ_C = 43°-12'-44.13"	
L_C = 1108.22'		θ_S = 04°-50'-06.24"	
T_S = 855.57'/855.57'		E = 111.05'	
E_Q = 4.00"		M = 103.24'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	0.37"	2.82"
V_{MPH}	=	40	50
JERK RATE ENT	=	16.92	1.76
JERK RATE EXT	=	16.92	1.76

0 20 40
SCALE IN FEET

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

No.	Revisions	Date	By

AMTRAK

Office of Engineering
National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved | Date

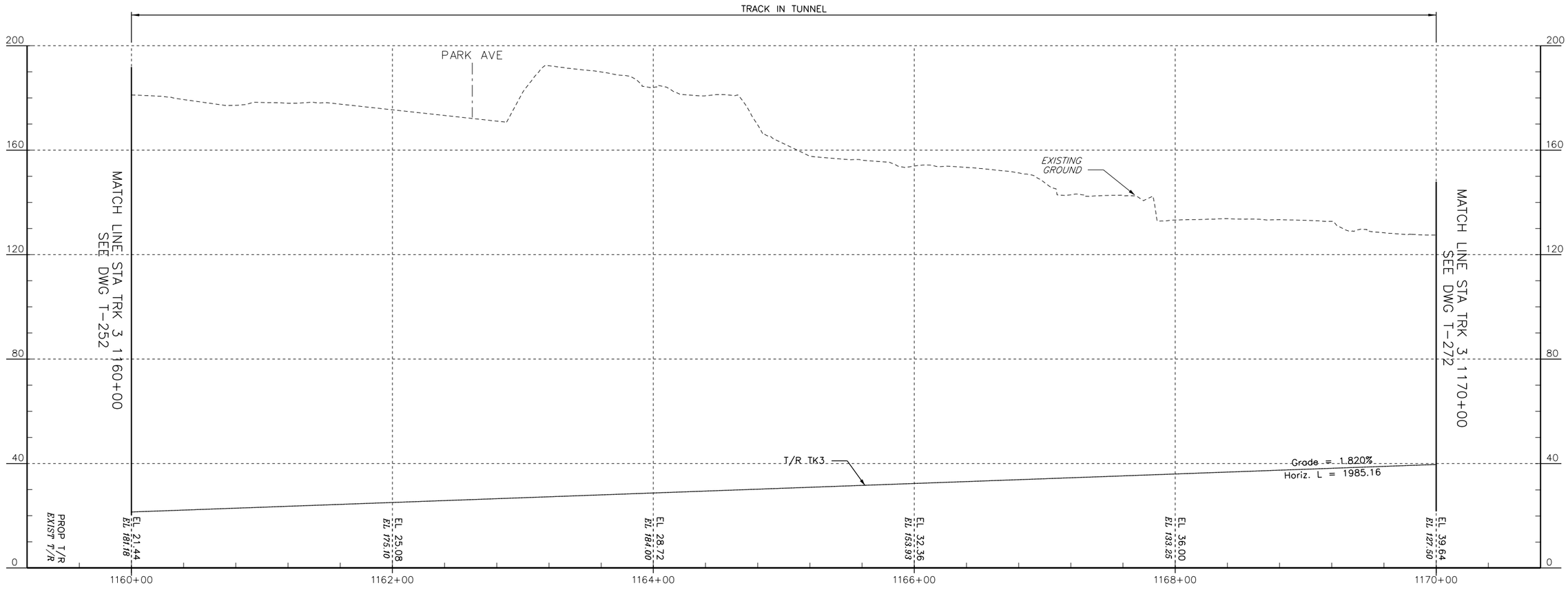
WORK IN PROGRESS

A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL
TRACK PLAN
STA TK2 1160+00 TO STA TK2 1170+00

Designed	Drawn	Checked	Date 09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-261



PROFILE – TRACK 3

0 40 80 HORIZ. SCALE IN FEET

0 20 40 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

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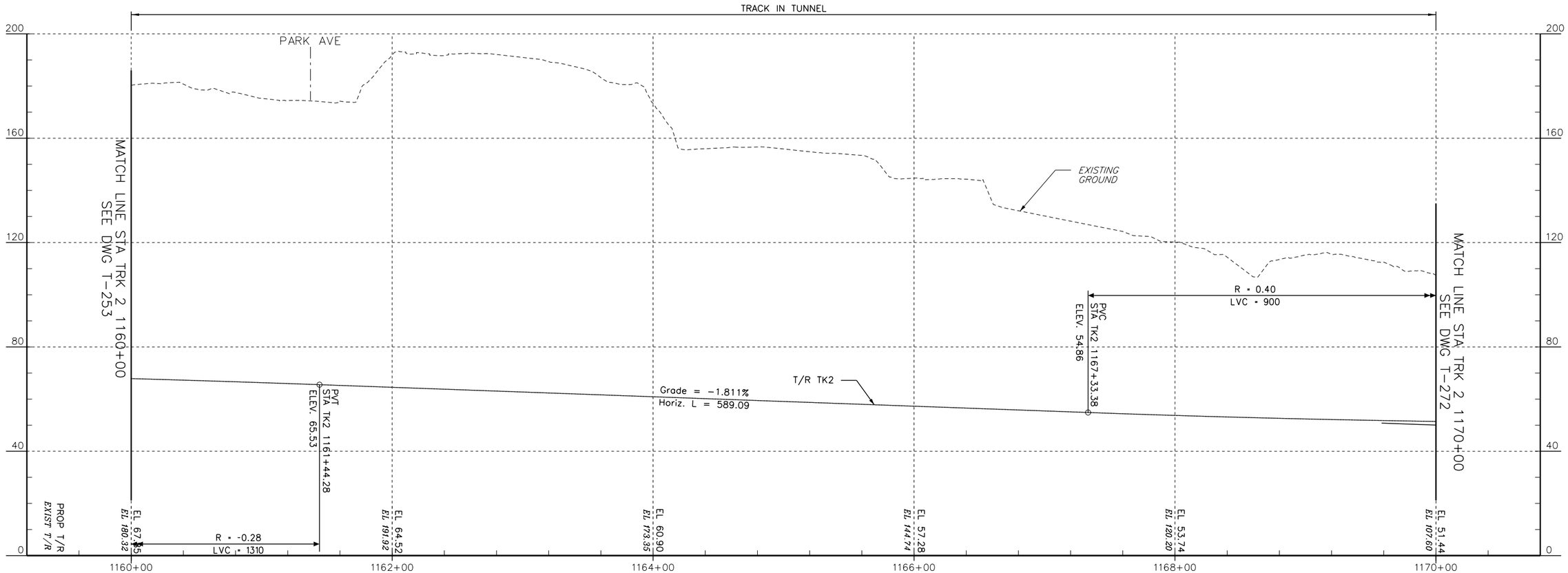
PROFILE – TRACK 3
STA. 1160+00 TO STA. 1170+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-262



PROFILE – TRACK 2

0 40 80 HORIZ. SCALE IN FEET

0 20 40 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering
National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

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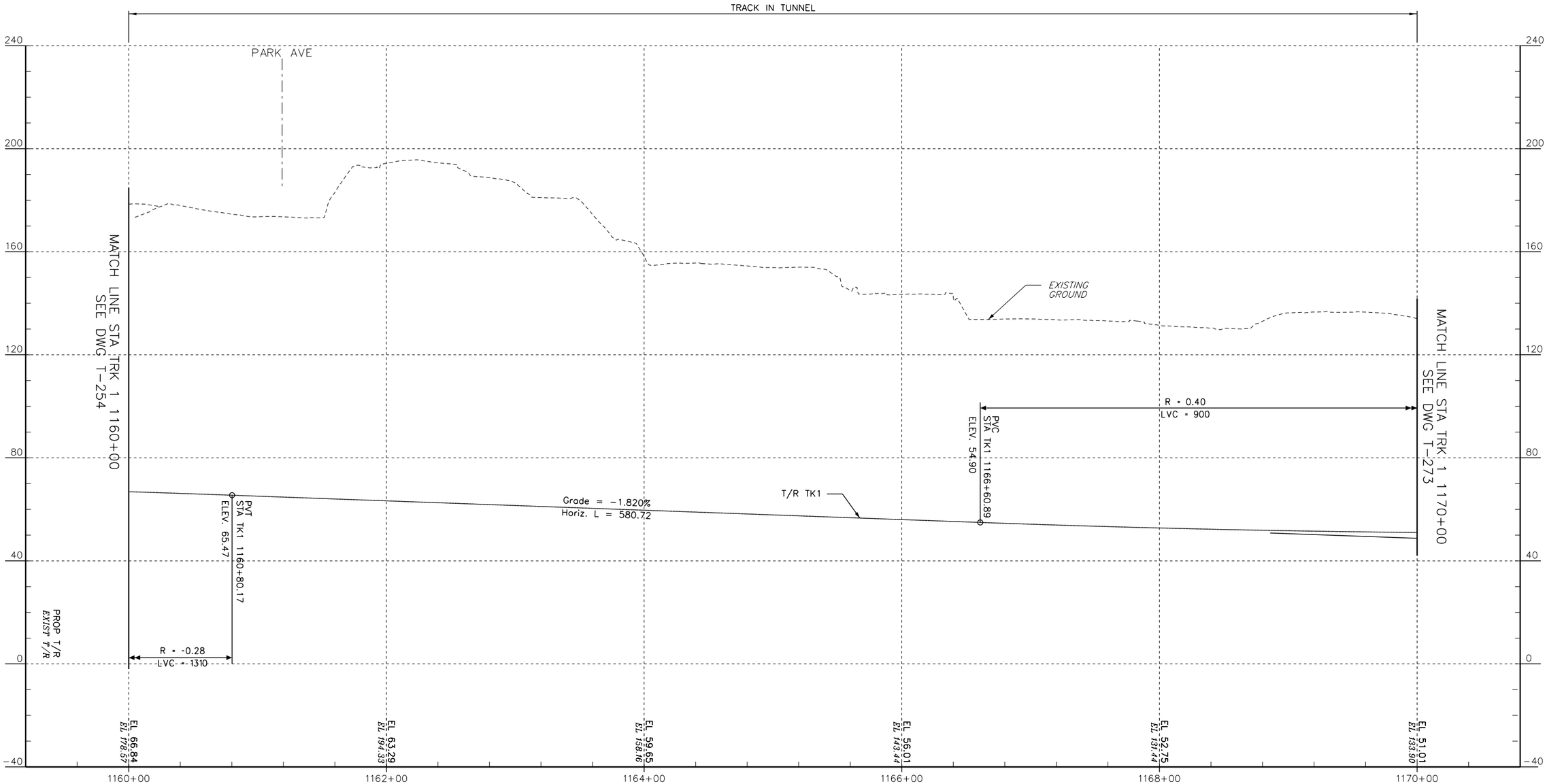
BALTIMORE, MD MPXX
B&P TUNNEL

PROFILE – TRACK 2
STA. 1160+00 TO STA. 1170+00

Designed	Drawn	Checked	Date
DO	JB	FB	09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-263



PROFILE – TRACK 1

HORIZ. SCALE IN FEET 0 20 40

VERT. SCALE IN FEET 0 10 20

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

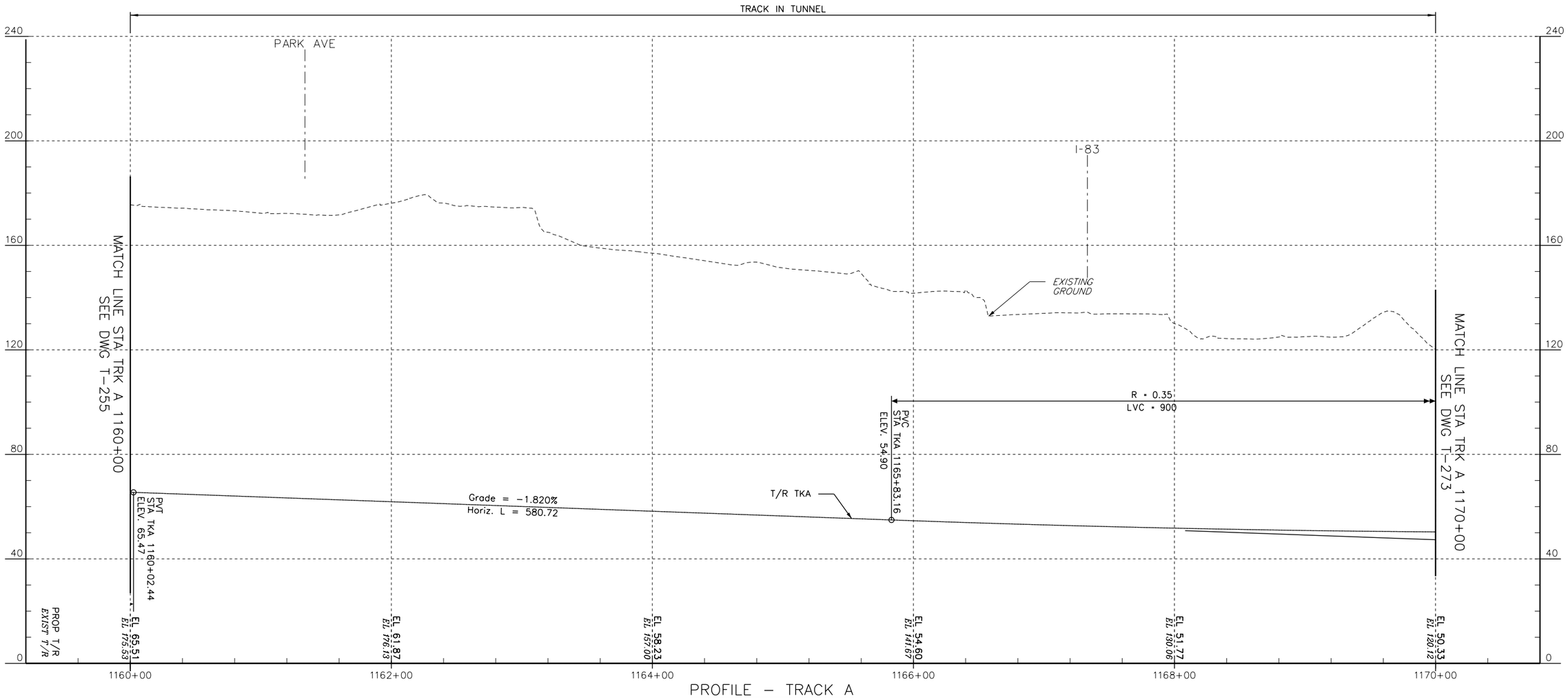
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

PROFILE – TRACK 1
STA. 1160+00 TO STA. 1170+00

Designed	Drawn	Checked	Date
DO	JB	FB	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-264



PROFILE – TRACK A

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved | Date

WORK IN PROGRESS

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BALTIMORE, MD MPXX
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PROFILE – TRACK A
STA. 1160+00 TO STA. 1170+00

Designed	Drawn	Checked	Date
DO	JB	FB	09/28/2016

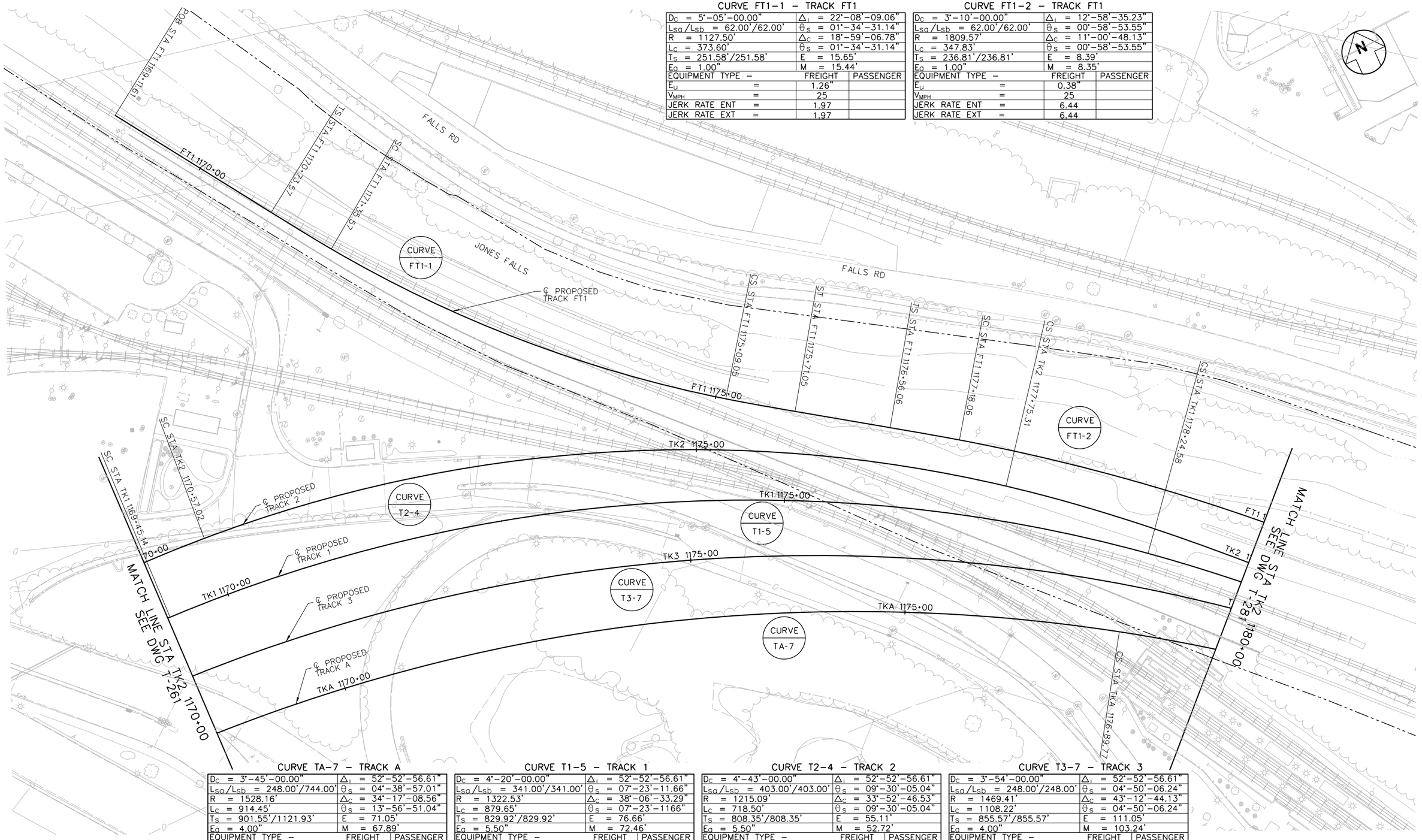
Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-265

CURVE FT1-1 – TRACK FT1

D_C = 5°-05'-00.00"		Δ_I = 22°-08'-09.06"	
L_{SA}/L_{SB} = 62.00'/62.00'		θ_S = 01°-34'-31.14"	
R = 1127.50'		Δ_C = 18°-59'-06.78"	
L_C = 373.60'		θ_S = 01°-34'-31.14"	
T_S = 251.58'/251.58'		E = 15.65'	
E_Q = 1.00"		M = 15.44'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	1.26"	
V_{MPH}	=	25	
JERK RATE ENT	=	1.97	
JERK RATE EXT	=	1.97	

CURVE FT1-2 – TRACK FT1

D_C = 3°-10'-00.00"		Δ_I = 12°-58'-35.23"	
L_{SA}/L_{SB} = 62.00'/62.00'		θ_S = 00°-58'-53.55"	
R = 1809.57'		Δ_C = 11°-00'-48.13"	
L_C = 347.83'		θ_S = 00°-58'-53.55"	
T_S = 236.81'/236.81'		E = 8.39'	
E_Q = 1.00"		M = 8.35'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	0.38"	
V_{MPH}	=	25	
JERK RATE ENT	=	6.44	
JERK RATE EXT	=	6.44	



CURVE TA-7 – TRACK A

D_C = 3°-45'-00.00"		Δ_I = 52°-52'-56.61"	
L_{SA}/L_{SB} = 248.00'/744.00'		θ_S = 04°-38'-57.01"	
R = 1528.16'		Δ_C = 34°-17'-08.56"	
L_C = 914.45'		θ_S = 13°-56'-51.04"	
T_S = 901.55'/1121.93'		E = 71.05'	
E_Q = 4.00"		M = 67.89'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	0.20"	2.56"
V_{MPH}	=	40	50
JERK RATE ENT	=	31.23	1.94
JERK RATE EXT	=	93.70	5.81

CURVE T1-5 – TRACK 1

D_C = 4°-20'-00.00"		Δ_I = 52°-52'-56.61"	
L_{SA}/L_{SB} = 341.00'/341.00'		θ_S = 07°-23'-11.66"	
R = 1322.53'		Δ_C = 38°-06'-33.29"	
L_C = 879.65'		θ_S = 07°-23'-1166"	
T_S = 829.92'/829.92'		E = 76.66'	
E_Q = 5.50"		M = 72.46'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-0.65"	3.67"
V_{MPH}	=	40	55
JERK RATE ENT	=	-13.14	1.69
JERK RATE EXT	=	-13.14	1.69

CURVE T2-4 – TRACK 2

D_C = 4°-43'-00.00"		Δ_I = 52°-52'-56.61"	
L_{SA}/L_{SB} = 403.00'/403.00'		θ_S = 09°-30'-05.04"	
R = 1215.09'		Δ_C = 33°-52'-46.53"	
L_C = 718.50'		θ_S = 09°-30'-05.04"	
T_S = 808.35'/808.35'		E = 55.11'	
E_Q = 5.50"		M = 52.72'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	-0.22"	4.48"
V_{MPH}	=	40	55
JERK RATE ENT	=	-45.85	1.63
JERK RATE EXT	=	-45.85	1.63

CURVE T3-7 – TRACK 3

D_C = 3°-54'-00.00"		Δ_I = 52°-52'-56.61"	
L_{SA}/L_{SB} = 248.00'/248.00'		θ_S = 04°-50'-06.24"	
R = 1469.41'		Δ_C = 43°-12'-44.13"	
L_C = 1108.22'		θ_S = 04°-50'-06.24"	
T_S = 855.57'/855.57'		E = 111.05'	
E_Q = 4.00"		M = 103.24'	
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	0.37"	2.82"
V_{MPH}	=	40	50
JERK RATE ENT	=	16.92	1.76
JERK RATE EXT	=	16.92	1.76

0 20 40
SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering
National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved Date
WORK IN PROGRESS

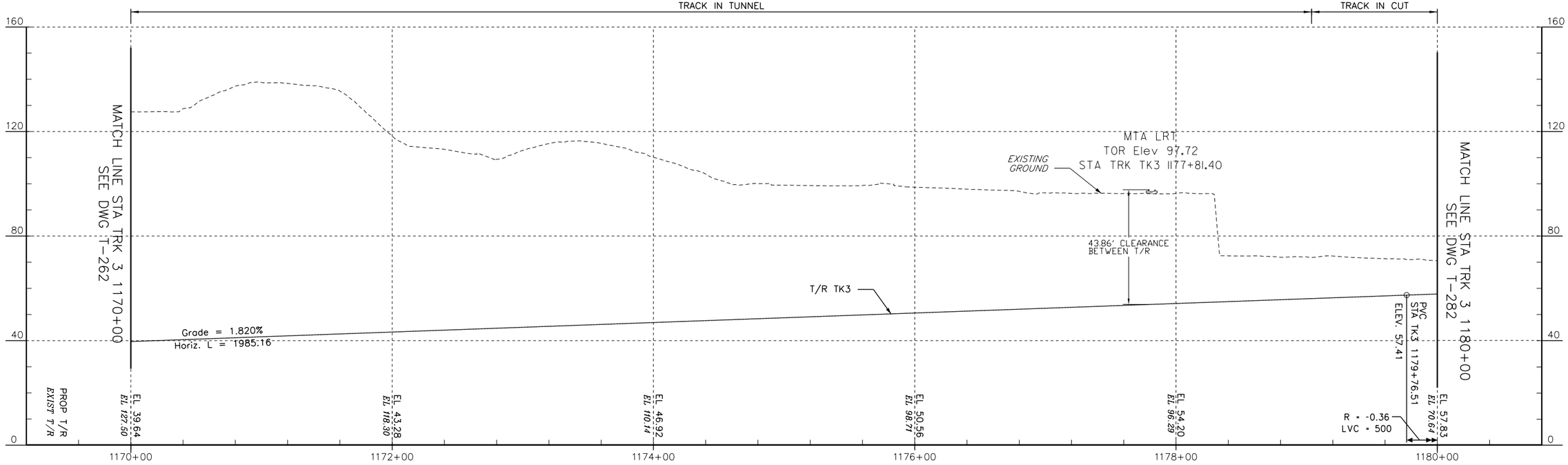
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

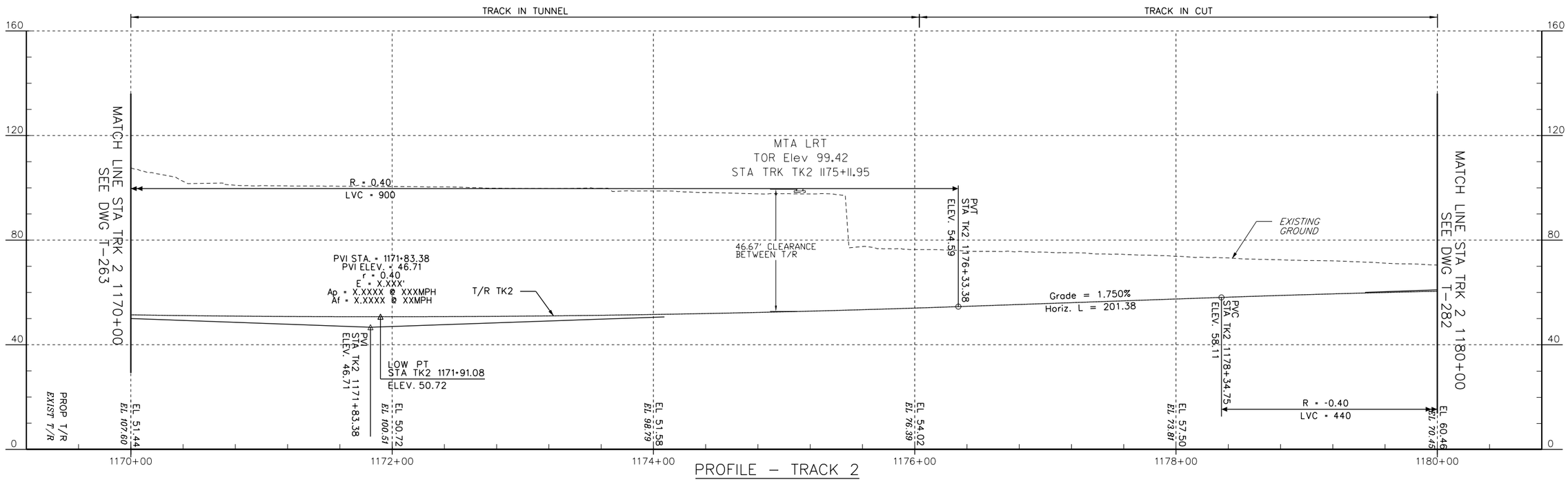
TRACK PLAN
STA TK2 1170+00 TO STA TK2 1180+00

Designed	Drawn	Checked	Date 09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-271



PROFILE – TRACK 3



PROFILE – TRACK 2

0 40 80
HORIZ. SCALE IN FEET

0 20 40
VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved | Date

WORK IN PROGRESS

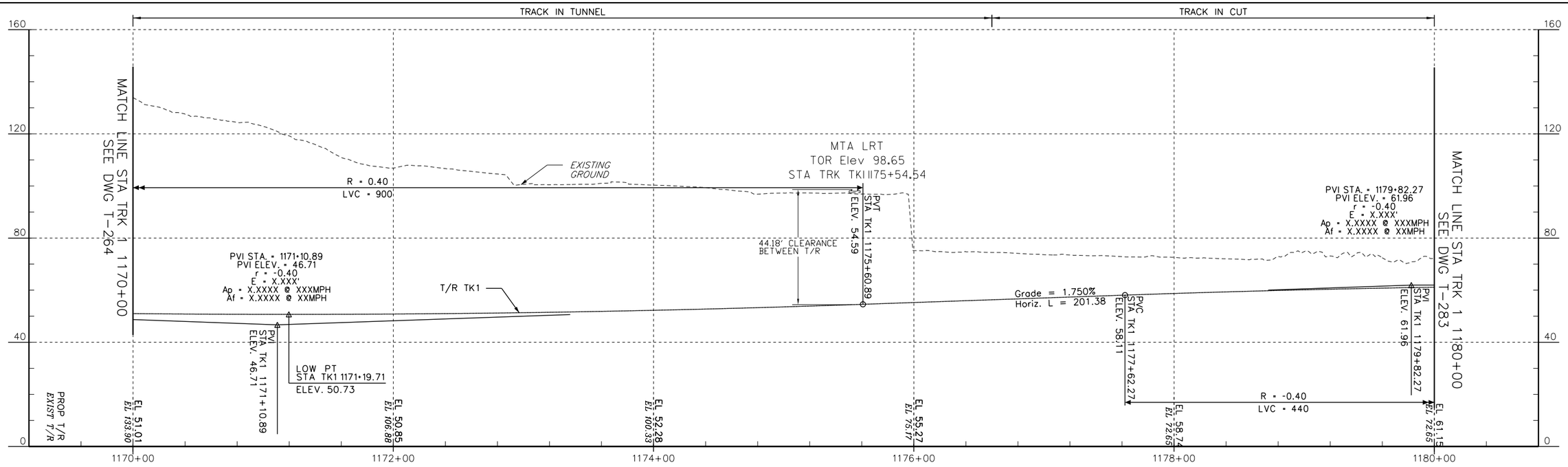
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

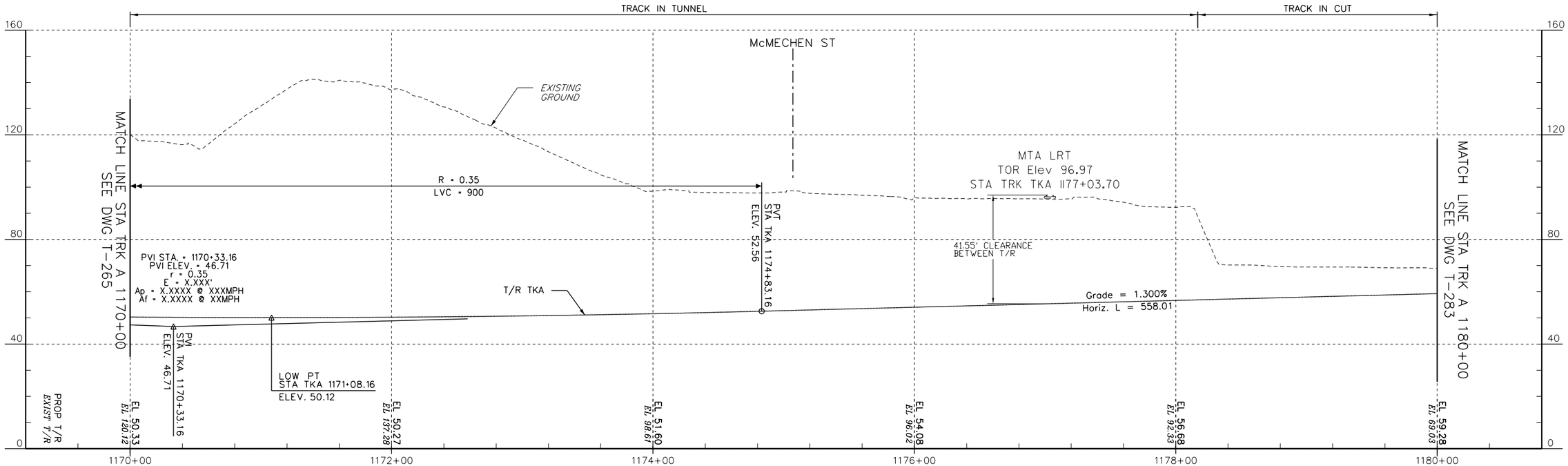
PROFILES – TRACK 2 & TRACK 3
STA. 1170+00 TO STA. 1180+00

Designed DO | Drawn JB | Checked FB | Date 09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-272



PROFILE – TRACK 1



PROFILE – TRACK A

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

No.	Revisions	Date	By

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

PROFILES – TRACK A & TRACK 1
STA. 1170+00 TO STA. 1180+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-273

CURVE FT1-2 – TRACK FT1

D_C = 3°-10'-00.00"	Δ_I = 12°-58'-35.23"		
L_{SA}/L_{SB} = 62.00'/62.00'	θ_S = 00°-58'-53.55"		
R = 1809.57'	Δ_C = 11°-00'-48.13"		
L_C = 347.83'	θ_S = 00°-58'-53.55"		
T_S = 236.81'/236.81'	E = 8.39'		
E_Q = 1.00"	M = 8.35'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U =		0.38"	
V_{MPH} =		25	
JERK RATE ENT =		6.44	
JERK RATE EXT =		6.44	

CURVE FT1-3 – TRACK FT1

D_C = 5°-05'-00.00"	Δ_I = 06°-54'-15.29"		
L_{SA}/L_{SB} = 62.00'/62.00'	θ_S = 01°-34'-31.14"		
R = 1127.50'	Δ_C = 03°-45'-13.02"		
L_C = 73.87'	θ_S = 01°-34'-31.14"		
T_S = 99.02'/99.02'	E = 0.61'		
E_Q = 1.00"	M = 0.60'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U =		1.26"	
V_{MPH} =		25	
JERK RATE ENT =		1.97	
JERK RATE EXT =		1.97	

FALLS RD

JONES FALLS

AMTRAK ROW

N HOWARD ST

W NORTH AVE

MCMECHEN ST

CURVE FT1-2

CURVE FT1-3

CURVE T3-7

CS STA FT1 1180+65.85

ST STA FT1 1181+27.85

ST STA TK2 1181+78.31

PS STA TK2 1182+05.29

PI STA TK2 1182+45.27

ST STA TK1 1181+65.58

EXISTING CSX RAILROAD BRIDGE TO BE RECONSTRUCTED. SEE STRUCTURAL PLANS FOR DETAILS

℄ PROPOSED TRACK FT1

℄ PROPOSED TRACK TK2

℄ PROPOSED TRACK TK3

℄ PROPOSED TRACK TK1

℄ PROPOSED TRACK TKA

TS STA FT1 1184+13.65

SC STA FT1 1184+75.65

CS STA FT1 1185+49.49

ST STA FT1 1186+11.49

PC STA FT1 1186+81.49

PT STA FT1 1187+69.96

PI STA TK2 1188+59.70

POE STA FT1 1188+89.60

PS STA TK2 1188+89.60

96 MP

FT1 1185+00

TK2 1185+00

TK1 1185+00

TK3 1185+00

TKA 1185+00

RH +10 RBM

DSS +10

LH +10 RBM

MATCH LINE STA TK2 1180+00 SEE DWG T-271

MATCH LINE STA TK2 1190+00 SEE DWG T-291

CS STA TK3 1180+67.92

ST STA TK3 1183+15.92

PI STA TK1 1183+65.48

PS STA TK1 1184+05.46

PS STA TK1 1185+05.46

PI STA TK1 1185+45.44

ST STA TKA 1184+33.77

PS STA TKA 1185+40.43

PI STA TKA 1185+80.41

PI STA TK3 1188+24.65

PS STA TK3 1188+64.63

EXISTING ℄ TRACK 3

EXISTING ℄ TRACK 2

EXISTING NORTH PORTAL B&P TUNNELS

JONES FALLS UG 95.95

CURVE T3-7 – TRACK 3

D_C = 3°-54'-00.00"	Δ_I = 52°-52'-56.61"		
L_{SA}/L_{SB} = 248.00'/248.00'	θ_S = 04°-50'-06.24"		
R = 1469.41'	Δ_C = 43°-12'-44.13"		
L_C = 1108.22'	θ_S = 04°-50'-06.24"		
T_S = 855.57'/855.57'	E = 111.05'		
E_Q = 4.00"	M = 103.24'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U =		0.37"	2.82"
V_{MPH} =		40	50
JERK RATE ENT =		16.92	1.76
JERK RATE EXT =		16.92	1.76

0 20 40
SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved | Date

WORK IN PROGRESS

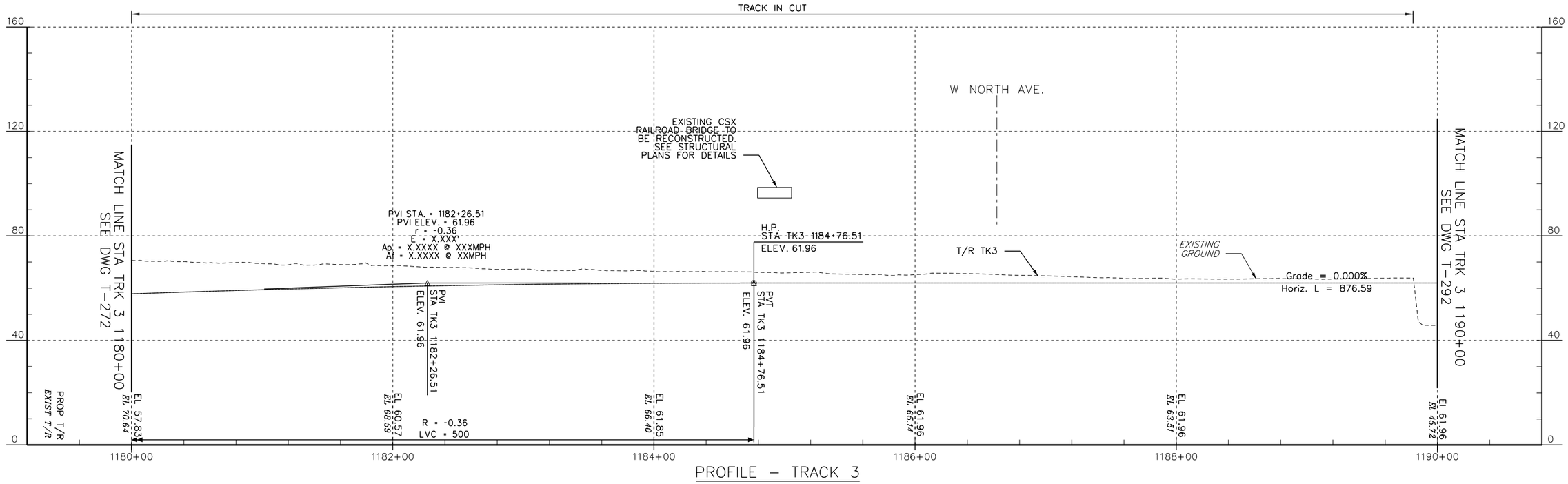
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

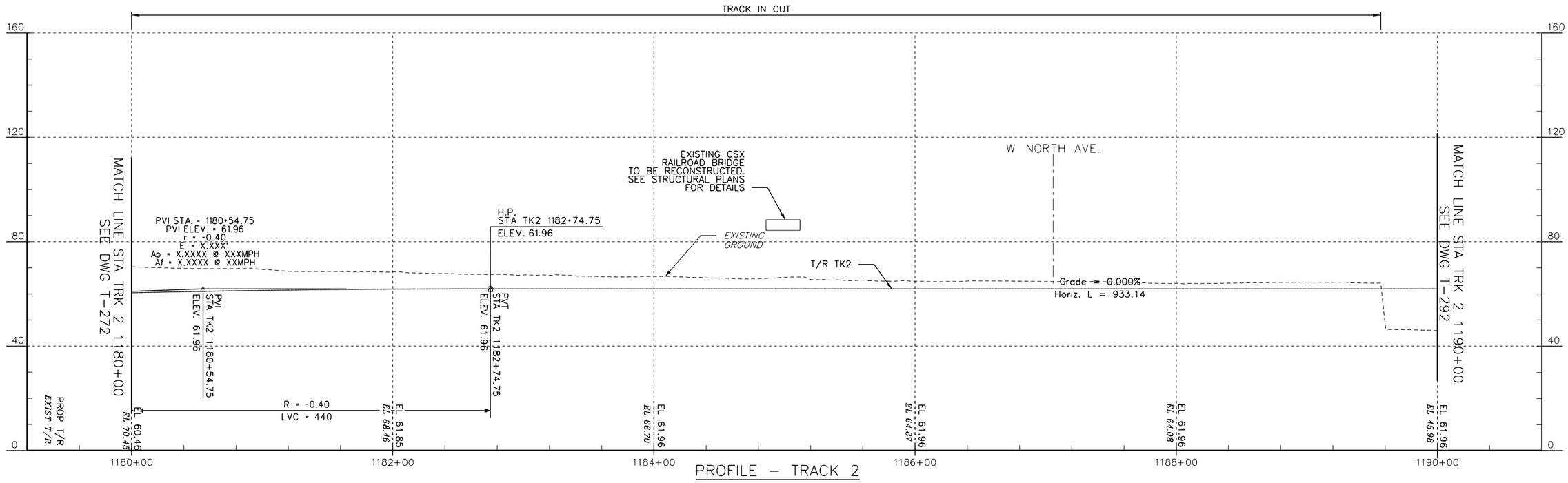
TRACK PLAN
STA TK2 1180+00 TO STA TK2 1190+00

Designed	Drawn	Checked	Date 09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-281



PROFILE – TRACK 3



PROFILE – TRACK 2

0 40 80
HORIZ. SCALE IN FEET

0 20 40
VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

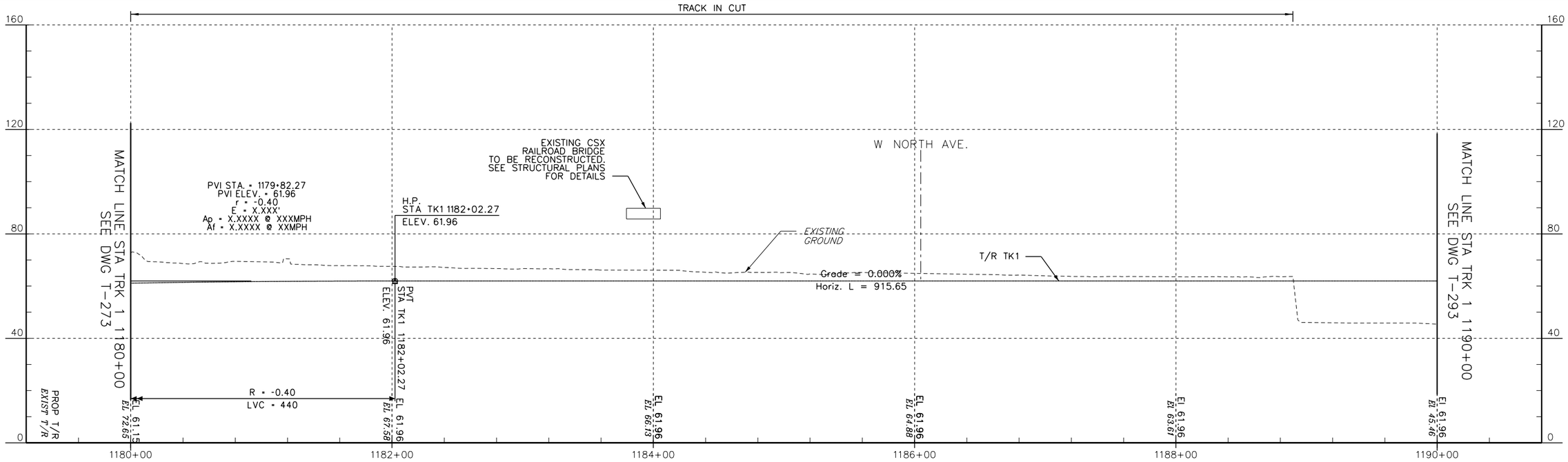
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

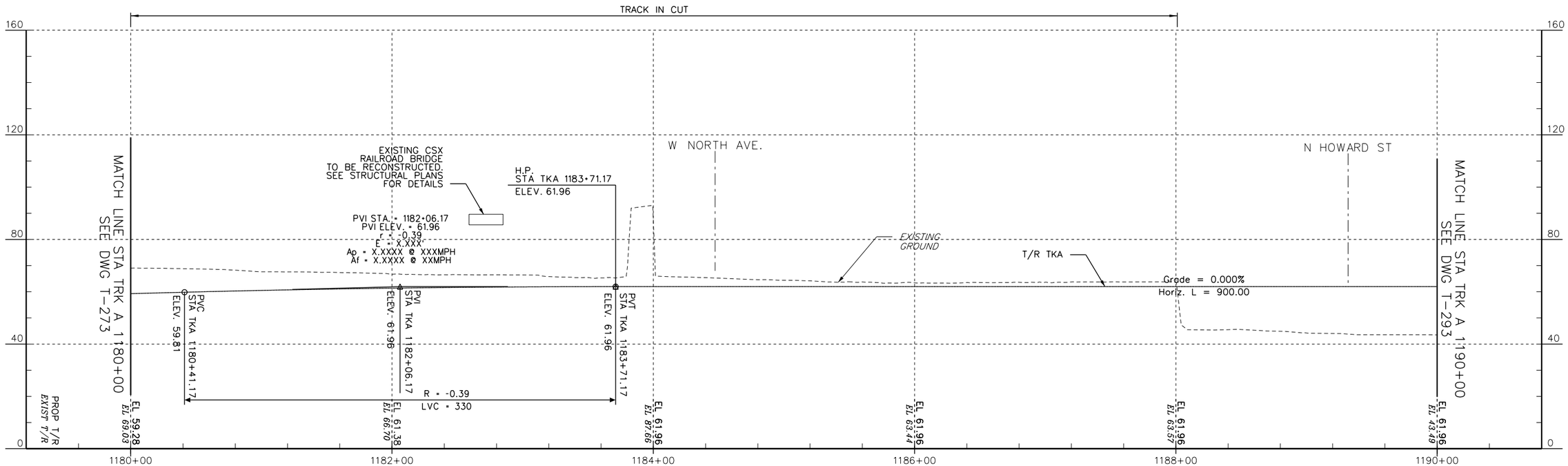
PROFILES – TRACK 2 & TRACK 3
STA. 1180+00 TO STA. 1190+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-282



PROFILE – TRACK 1



PROFILE – TRACK A

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

No.	Revisions	Date	By

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Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

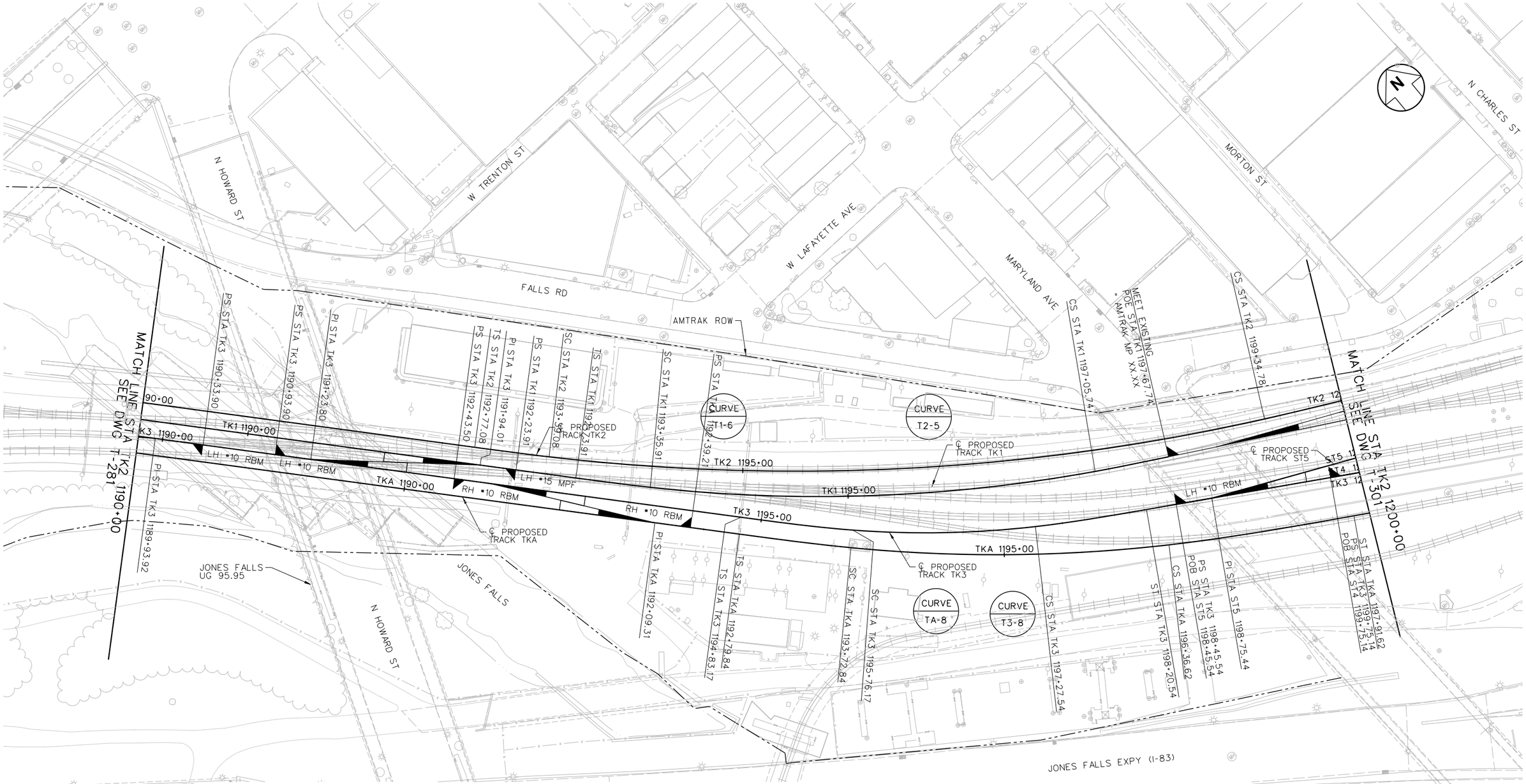
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

PROFILES – TRACK A & TRACK 1
STA. 1180+00 TO STA. 1190+00

Designed	DO	Drawn	JB	Checked	FB	Date	09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-283



CURVE TA-8 – TRACK A

D_C = 4°-35'-00.00"	Δ_I = 17°-46'-18.11"		
L_{SC}/L_{SB} = 93.00'/155.00'	θ_S = 02°-07'-50.45"		
R = 1250.42'	Δ_C = 12°-05'-23.57"		
L_C = 263.85'	θ_S = 03°-33'-04.09"		
T_S = 243.72'/271.43'	E = 6.99'		
E_Q = 1.50"	M = 6.95'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	1.39"	1.39"
V_{MPH}	=	30	30
JERK RATE ENT	=	2.24	2.24
JERK RATE EXT	=	3.73	3.73

CURVE T1-6 – TRACK 1

D_C = 4°-30'-00.00"	Δ_I = 19°-25'-24.76"		
L_{SC}/L_{SB} = 62.00'/62.00'	θ_S = 01°-23'-40.71"		
R = 1273.57'	Δ_C = 16°-38'-03.34"		
L_C = 369.75'	θ_S = 01°-23'-40.71"		
T_S = 248.99'/248.99'	E = 13.54'		
E_Q = 1.00"	M = 13.39'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	0.97"	1.83"
V_{MPH}	=	25	30
JERK RATE ENT	=	2.56	1.13
JERK RATE EXT	=	2.56	1.13

CURVE T2-5 – TRACK 2

D_C = 3°-15'-00.00"	Δ_I = 21°-22'-30.85"		
L_{SC}/L_{SB} = 62.00'/62.00'	θ_S = 01°-00'-26.51"		
R = 1763.18'	Δ_C = 19°-21'-37.82"		
L_C = 595.79'	θ_S = 01°-00'-26.51"		
T_S = 363.78'/363.78'	E = 25.47'		
E_Q = 1.00"	M = 25.11'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	1.05"	1.05"
V_{MPH}	=	30	30
JERK RATE ENT	=	1.97	1.97
JERK RATE EXT	=	1.97	1.97

CURVE T3-8 – TRACK 3

D_C = 7°-10'-00.00"	Δ_I = 17°-30'-31.71"		
L_{SC}/L_{SB} = 93.00'/93.00'	θ_S = 03°-19'-49.18"		
R = 800.00'	Δ_C = 10°-50'-53.35"		
L_C = 151.47'	θ_S = 03°-19'-49.18"		
T_S = 169.76'/169.76'	E = 3.60'		
E_Q = 1.50"	M = 3.58'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	1.63"	3.01"
V_{MPH}	=	25	30
JERK RATE ENT	=	2.28	1.03
JERK RATE EXT	=	2.28	1.03

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

No.	Revisions	Date	By

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved | Date

WORK IN PROGRESS

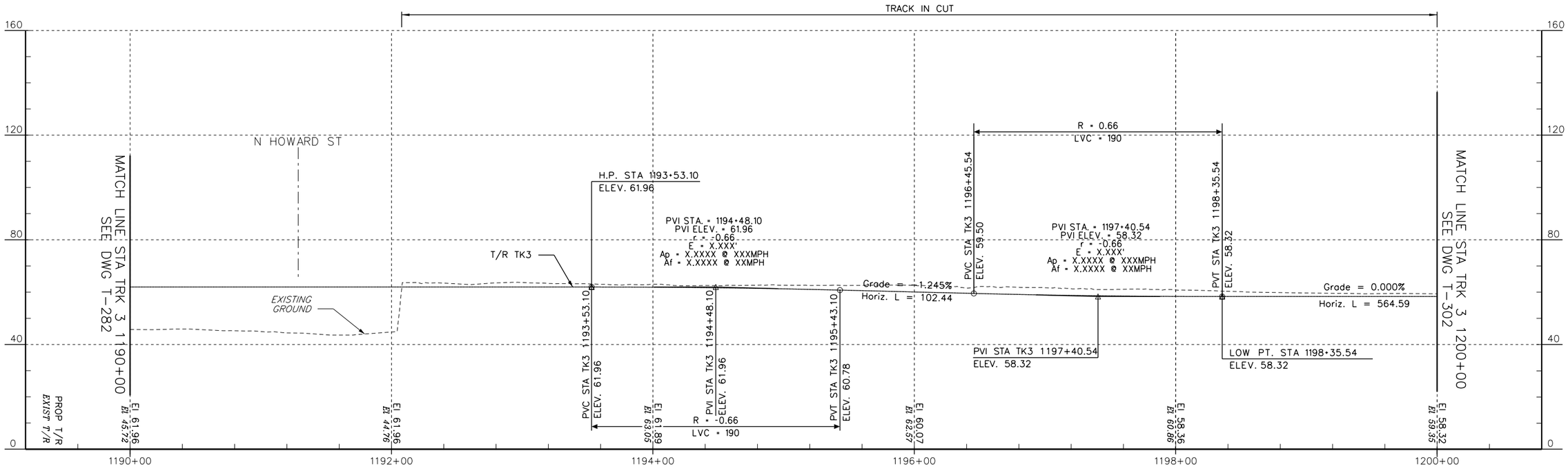
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

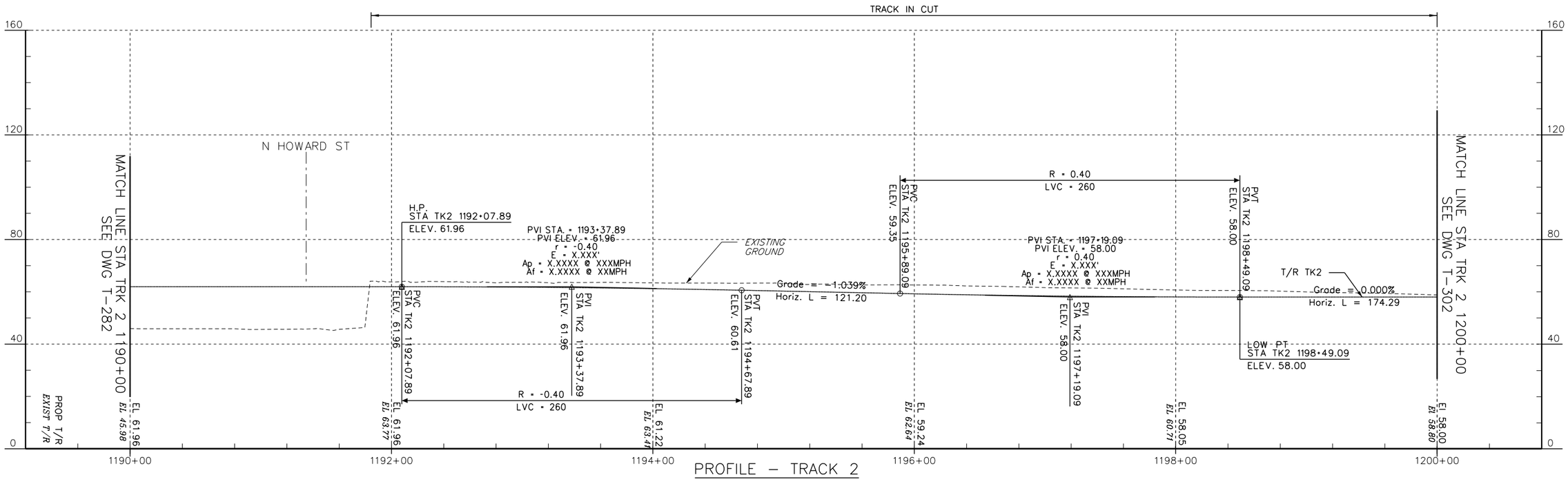
TRACK PLAN
STA TK2 1190+00 TO STA TK2 1200+00

Designed	Drawn	Checked	Date 09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-291



PROFILE – TRACK 3



PROFILE – TRACK 2

0 40 80
HORIZ. SCALE IN FEET

0 20 40
VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

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National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

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WORK IN PROGRESS

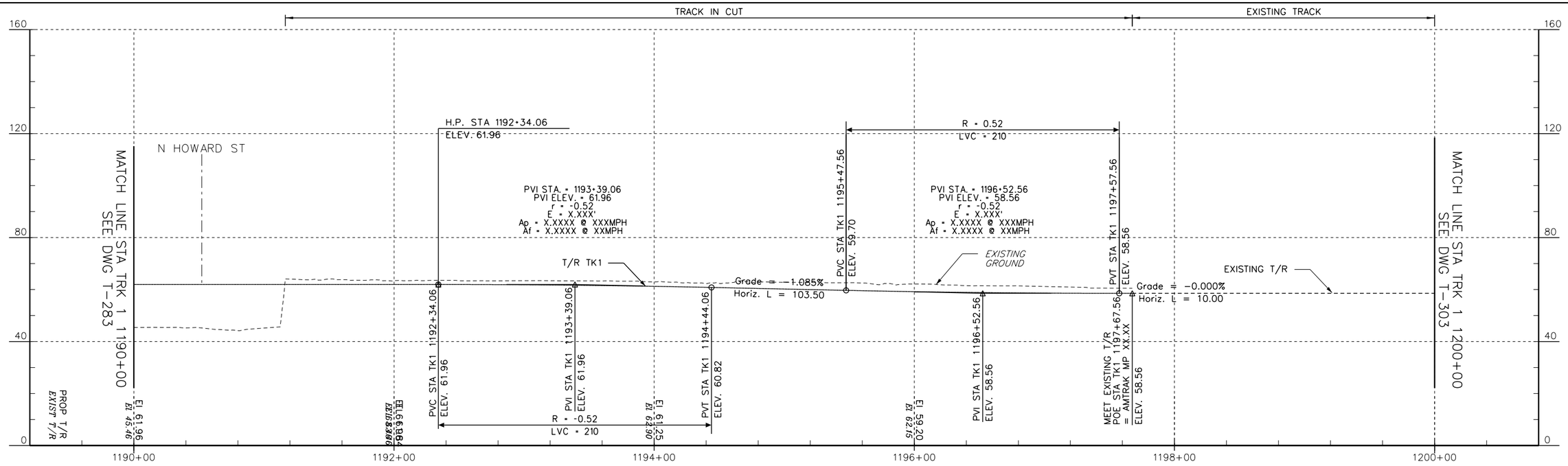
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

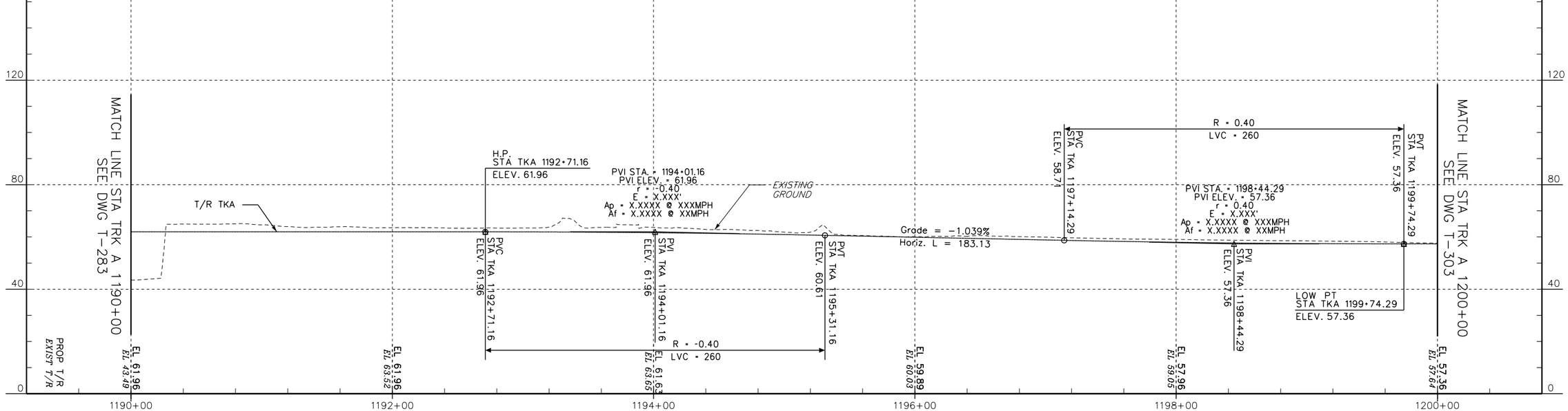
PROFILES – TRACK 2 & TRACK 3
STA. 1190+00 TO STA. 1200+00

Designed	Drawn	Checked	Date 09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-292



PROFILE – TRACK 1



PROFILE – TRACK A

0 20 40 HORIZ. SCALE IN FEET

0 10 20 VERT. SCALE IN FEET

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

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Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved | Date

WORK IN PROGRESS

A Parsons Brinckerhoff/Parsons Joint Venture

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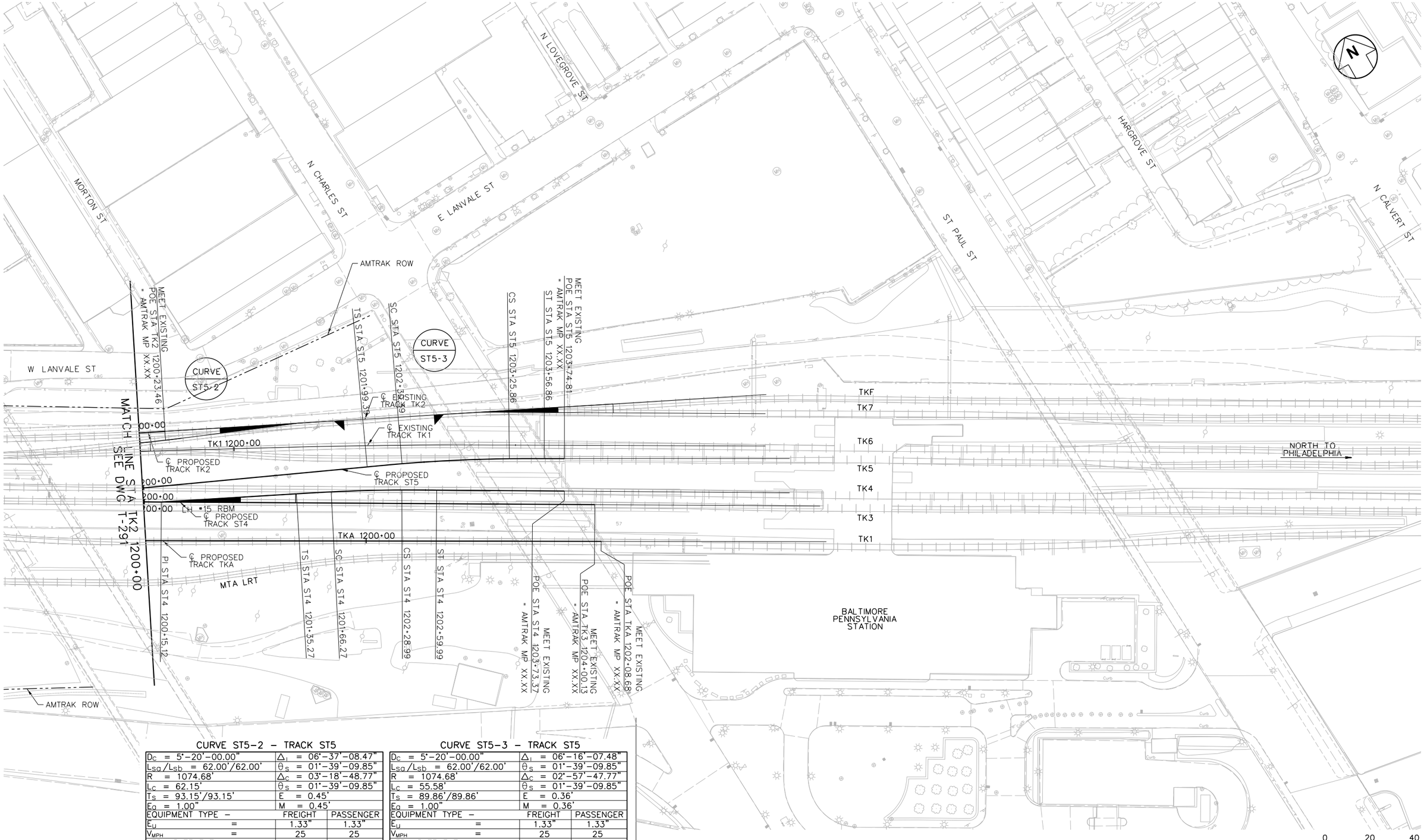
B&P TUNNEL

PROFILES – TRACK A & TRACK 1
STA. 1190+00 TO STA. 1200+00

Designed DO | Drawn JB | Checked FB | Date 09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-293



CURVE ST5-2 – TRACK ST5

D_C = 5°-20'-00.00"	Δ_I = 06°-37'-08.47"		
L_{SA}/L_{SB} = 62.00'/62.00'	θ_S = 01°-39'-09.85"		
R = 1074.68'	Δ_C = 03°-18'-48.77"		
L_C = 62.15'	θ_S = 01°-39'-09.85"		
T_S = 93.15'/93.15'	E = 0.45'		
E_Q = 1.00"	M = 0.45'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	1.33"	1.33"
V_{MPH}	=	25	25
JERK RATE ENT	=	1.86	1.86
JERK RATE EXT	=	1.86	1.86

CURVE ST5-3 – TRACK ST5

D_C = 5°-20'-00.00"	Δ_I = 06°-16'-07.48"		
L_{SA}/L_{SB} = 62.00'/62.00'	θ_S = 01°-39'-09.85"		
R = 1074.68'	Δ_C = 02°-57'-47.77"		
L_C = 55.58'	θ_S = 01°-39'-09.85"		
T_S = 89.86'/89.86'	E = 0.36'		
E_Q = 1.00"	M = 0.36'		
EQUIPMENT TYPE –		FREIGHT	PASSENGER
E_U	=	1.33"	1.33"
V_{MPH}	=	25	25
JERK RATE ENT	=	1.86	1.86
JERK RATE EXT	=	1.86	1.86

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved | Date

WORK IN PROGRESS

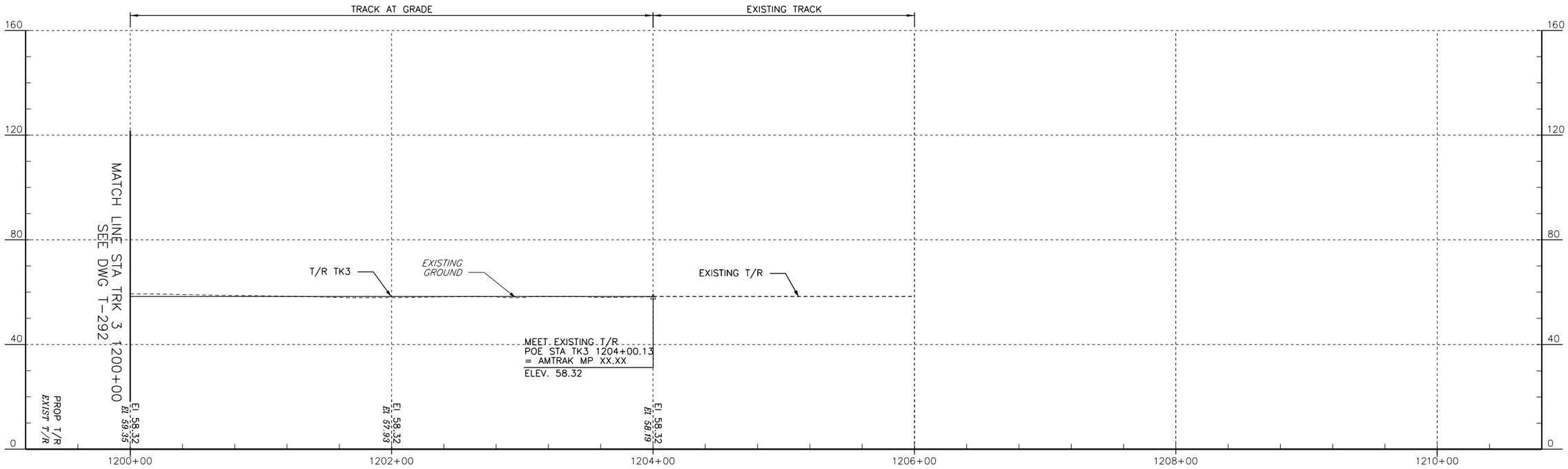
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

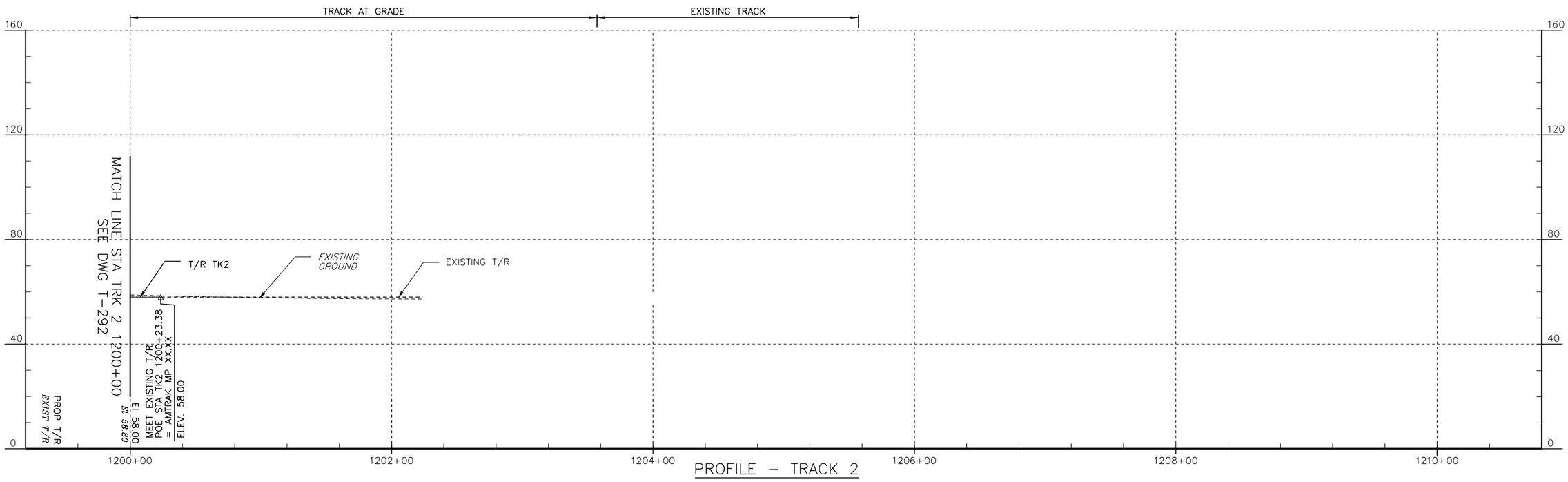
TRACK PLAN
STA TK2 1200+00 TO STA TK2 1200+23.46

Designed	Drawn	Checked	Date 09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-301



PROFILE – TRACK 3



PROFILE – TRACK 2

0 40 80 HORIZ. SCALE IN FEET

0 20 40 VERT. SCALE IN FEET

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

No.	Revisions	Date	By

AMTRAK

Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

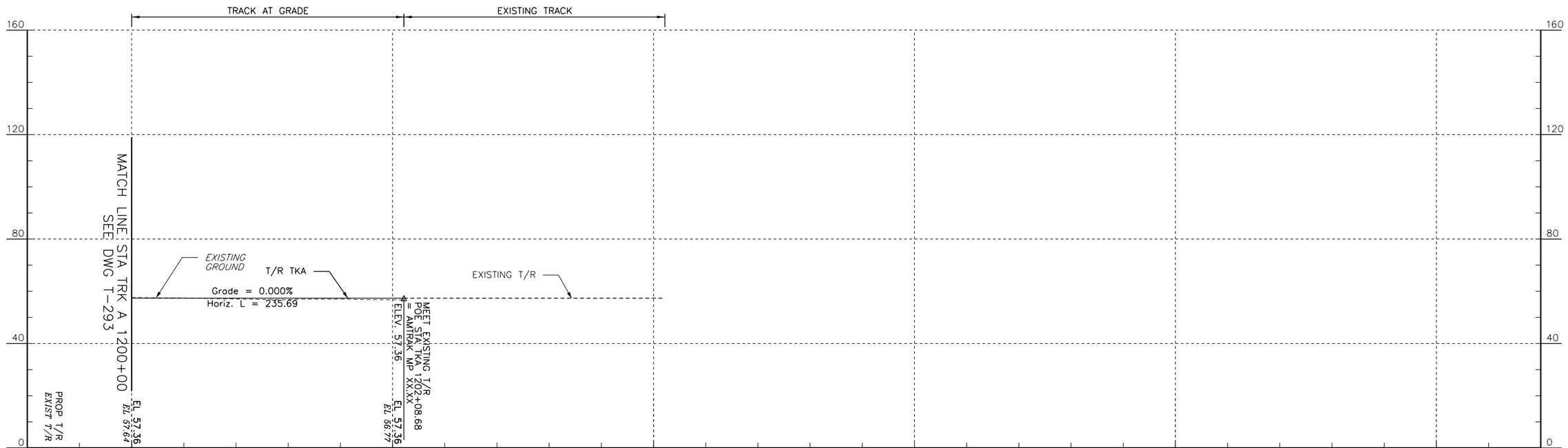
A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

PROFILES – TRACK 2 & TRACK 3
STA. 1200+00 TO STA. 1210+00

Designed	Drawn	Checked	Date
DO	JB	FB	09/28/2016

Project No:	C.EN.201278
File name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-302



PROFILE – TRACK A

HORIZ. SCALE IN FEET 0 20 40

VERT. SCALE IN FEET 0 10 20

No.	Revisions	Date	By

$DATE$ $TIME$
PLOT SCALE: AS SHOWN
STANDARD PEN TABLE: NO

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Office of Engineering

National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

Approved	Date
WORK IN PROGRESS	

A Parsons Brinckerhoff/Parsons Joint Venture

BALTIMORE, MD MPXX
B&P TUNNEL

PROFILES – TRACK A & TRACK 1
STA. 1200+00 TO STA. 1210+00

Designed	Drawn	Checked	Date
DO	JB	FB	09/28/2016

Project No:	C.EN.201278
file name. No:	XXXXX
Sheet No.	OF XX
Dwg. No.	T-303

Appendix D

B&P TUNNEL PROJECT

Agency Correspondence

U.S. Department of Transportation
Federal Railroad Administration

Maryland Department
of Transportation

MARYLAND DEPARTMENT OF
PLANNING

Larry Hogan, Governor
Boyd Rutherford, Lt. Governor

Wendi W. Peters, Secretary
Ewing McDowell, Deputy Secretary

November 23, 2016

Mr. Ryan Snyder, AICP
Associate Planner
RK&K Engineers
81 W. Mosher Street
Baltimore, MD 21217

STATE CLEARINGHOUSE REVIEW PROCESS
State Application Identifier: MD20161123-0967
Reply Due Date: 12/28/2016
Project Description: Final Environmental Impact Statement for the Baltimore & Potomac (B&P) Tunnel: Rehabilitation or Replacement of a 1.4-mile Long Rail Tunnel along the Northeast Corridor in Balto.: 3B Preferred Alternative - Provides less Residential, Business, and Facility Displacements (Prior: MD20151222-1081)
Project Location: Baltimore City
Clearinghouse Contact: Myra Barnes

Dear Mr. Snyder:

Thank you for submitting your project for intergovernmental review. Your participation in the Maryland Intergovernmental Review and Coordination (MIRC) process helps to ensure that your project will be consistent with the plans, programs, and objectives of State agencies and local governments.

We have forwarded your project to the following agencies and/or jurisdictions for their review and comments: the Maryland Department(s) of Natural Resources, the Environment; the Regional Agency(ies) of Baltimore Metropolitan Council; and the Maryland Department of Planning; including Maryland Historical Trust. A composite review and recommendation letter will be sent to you by the reply due date. Your project has been assigned a unique State Application Identifier that you should use on all documents and correspondence.

Please be assured that we will expeditiously process your project. The issues resolved through the MIRC process enhance the opportunities for project funding and minimize delays during project implementation.

If you need assistance or have questions, contact the State Clearinghouse staff noted above at 410-767-4490 or through e-mail at myra.barnes@maryland.gov. Thank you for your cooperation with the MIRC process.

Sincerely,

Myra L. Barnes

Myra Barnes, Lead Clearinghouse Coordinator

MB:MB
cc: Jaime Cramer - BCIT
16-0967_NRR.NEW.doc

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

December 27, 2016

Ms. Michelle Fishburne, PE
Environmental Protection Specialist
Office of Railroad Policy and Development
USDOT Federal Railroad Administration
1200 New Jersey Avenue, SE
Washington, DC 20590

Subject: Final Environmental Impact Statement (FEIS) & Section 4(f) Evaluation Baltimore & Potomac Tunnel Project CEQ #20160276

Dear Ms. Fishbourne:

In accordance with Section 102(2) (c) of the National Environmental Policy Act (NEPA), 42 U.S.C. § 4332(2) (c), Section 309 of the Clean Air Act, 42 U.S.C. § 7609, and the Council on Environmental Quality (CEQ) regulations, 40 CFR Parts 1500-1508, the U.S. Environmental Protection Agency (EPA) has reviewed the Final Environmental Impact Statement (FEIS) and the Section 4(f) evaluation for the Baltimore & Potomac Tunnel Project prepared by the Federal Railroad Administration (FRA).

As you are aware, the FEIS provides assessment of the potential environmental impacts (social, cultural and natural) of the alternatives to rehabilitate or replace the existing Baltimore and Potomac Tunnel. The FEIS provides the detailed environment assessment of the Preferred Alternative and a description of the potential mitigation of the impacts. On February 26, 2016, EPA provided comments of the Draft Environmental Impact Statement (DEIS) and rated the alternatives as EC-2 (Environmental Concern/Insufficent Information). EPA's concerns included:

- Soil/debris and hazardous material handling
- Intermediate ventilation plant site selection
- Air quality concerns
- Climate Change resiliency/Green House Gas emissions estimates
- Environmental Justice
- Cultural Resources

In Appendix I of the FEIS, the FRA provided responses to EPA's concerns. EPA appreciates the clarification and the commitments identified in FRA's responses. The FRA should continue to work with the Maryland Historical Trust in developing a Programmatic Agreement addressing the potential

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adverse effects to historic properties. When the agreement is finalized, please reference or include it in the project's Record of Decision (ROD). Further, the FRA should include in the Architectural Historic Properties Effect Assessment Report with the NEPA environmental documentation.

As the Baltimore and Potomac project moves forward, EPA suggests the following measures to protect, minimize and mitigate for any potential environmental impacts:

1. The assignment of an environmental monitor to oversee all of the potential environment issues including but not limited to, erosion and sediment, stormwater management, construction debris and hazardous waste handling and disposal, air emissions, noise and vibrations, community relations and cultural resources.
2. Insure and highlight provisions in the Request for Proposal (bidding process) that waste materials handling (soil, construction debris, hazardous waste) be properly disposed of in accordance all applicable regulation.
3. Use of low volatile organic compound (VOC) and/or sustainable architectural materials and supply equipment.
4. Incorporation of energy-efficient supplies whenever feasible.
5. Consideration of a Leadership in Energy and Environmental Design (LEED) approach to tunnel design.
6. Continue to engage the community on project planning, construction sequencing, and traffic pattern changes.
7. Continue to investigate additional measures to reduce noise and vibration levels during construction and operations of the tunnel.
8. Consideration of the use of Green Infrastructure in tunnel surface design as well as streetscaping, park and recreational areas in the affected communities.
9. Commitment in the ROD to Environmental Justice mitigation measures including funding for community development within the affected area, maintaining and improvement to publically owned parks and recreational areas.

Thank you for the opportunity to review this project. If you have questions regarding these comments, the staff contact for this project is Kevin Magerr; he can be reached at 215-814-5724 or Magerr.kevin@epa.gov

Sincerely,

Barbara Rudnick
NEPA Team Leader
Office of Environmental Programs

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MARYLAND DEPARTMENT OF
PLANNING

Larry Hogan, Governor
Boyd Rutherford, Lt. Governor

Wendi W. Peters, Secretary
Ewing McDowell, Deputy Secretary

December 28, 2016

Mr. Ryan Snyder, AICP
Associate Planner
RK&K Engineers
81 W. Mosher Street
Baltimore, MD 21217

STATE CLEARINGHOUSE RECOMMENDATION

State Application Identifier: MD20161123-0967
Applicant: RK&K Engineers
Project Description: Final Environmental Impact Statement for the Baltimore & Potomac (B&P) Tunnel: Rehabilitation or Replacement of a 1.4-mile Long Rail Tunnel along the Northeast Corridor in Balto.: 3B Preferred Alternative - Provides less Residential, Business, and Facility Displacements (Prior: MD20151222-1081)
Project Location: Baltimore City
Approving Authority: U.S. Department of Transportation DOT/FRA
Recommendation: Consistent with Qualifying Comment(s) and Contingent Upon Certain Action(s)

Dear Mr. Snyder:

In accordance with Presidential Executive Order 12372 and Code of Maryland Regulation 34.02.01.04-.06, the State Clearinghouse has coordinated the intergovernmental review of the referenced project. This letter constitutes the State process review and recommendation based upon comments received to date. This recommendation is valid for a period of three years from the date of this letter.

Review comments were requested from the Maryland Department(s) of Natural Resources, the Environment; Baltimore Metropolitan Council; and the Maryland Department of Planning, including the Maryland Historical Trust. As of this date, the Maryland Department of Natural Resources has not submitted comments. **This recommendation is contingent upon the applicant considering and addressing any problems or conditions that may be identified by their review. Any comments received will be forwarded.**

The Baltimore Metropolitan Council stated that, while the Baltimore Regional Transportation Board (BRTB) has been briefed on the proposed project and the general project goals are supported by the BRTB. The BRTB has no comment on the selected alternative.

Our Department (Planning) found this project to be consistent with their plans, programs, and objectives.

Planning indicated that it supports the Baltimore and Potomac Tunnel's Preferred alternative 3B since it meets the projects purpose while minimizing impacts to local businesses, residences and historic structures. Alternative 3B permits reconstruction of the West Baltimore MARC station in its existing location, which alleviates increased Right-of-Way (ROW) requirements.

The Baltimore and Potomac Tunnel project will allow for efficient and safe passenger and freight rail operations through the northeast corridor and will accommodate double-stacked containers benefitting the Port of Baltimore.

The Maryland Department of Environment (MDE) found this project to be generally consistent with their plans, programs, and objectives, but included certain qualifying comments summarized below.

1. If the proposed project involves demolition – Any above ground or underground petroleum storage tanks that may be on site must have contents and tanks along with any contamination removed. Please contact the Oil Control Program at (410) 537-3442 for additional information.

2. Any solid waste including construction, demolition and land clearing debris, generated from the subject project, must be properly disposed of at a permitted solid waste acceptance facility, or recycled if possible. Contact the Solid Waste Program at (410) 537-3315 for additional information regarding solid waste activities and contact the Waste Diversion and Utilization Program at (410) 537-3314 for additional information regarding recycling activities.

3. The Waste Diversion and Utilization Program should be contacted directly at (410) 537-3314 by those facilities which generate or propose to generate or handle hazardous wastes to ensure these activities are being conducted in compliance with applicable State and federal laws and regulations. The Program should also be contacted prior to construction activities to ensure that the treatment, storage or disposal of hazardous wastes and low-level radioactive wastes at the facility will be conducted in compliance with applicable State and federal laws and regulations.

4. The proposed project may involve rehabilitation, redevelopment, revitalization, or property acquisition of commercial, industrial property. Accordingly, MDE's Brownfields Site Assessment and Voluntary Cleanup Programs (VCP) may provide valuable assistance to you in this project. These programs involve environmental site assessment in accordance with accepted industry and financial institution standards for property transfer. For specific information about these programs and eligibility, please contact the Land Restoration Program at (410) 537-3437.

The Maryland Historical Trust stated that their finding of consistency is contingent upon the applicant taking the action(s) summarized below.

The Maryland Historical Trust (Trust) stated that the undertaking will have an adverse effect on historic properties. The Trust is actively working directly with the Federal Railroad Administration (FRA) and all consulting parties to execute a Section 106 programmatic agreement that will mitigate the project's adverse effects and conclude the Section 106 review process.

Any statement of consideration given to the comments should be submitted to the approving authority, with a copy to the State Clearinghouse. The State Application Identifier Number must be placed on any correspondence pertaining to this project. The State Clearinghouse must be kept informed if the approving authority cannot accommodate the recommendation.

Please remember, you must comply with all applicable state and local laws and regulations. If you need assistance or have questions, contact the State Clearinghouse staff person noted above at 410-767-4490 or through e-mail at myra.barnes@maryland.gov. **Also please complete the attached form and return it to the State Clearinghouse as soon as the status of the project is known.** ***Any substitutions of this form must include the State Application Identifier Number.*** **This will ensure that our files are complete.**

Thank you for your cooperation with the MIRC process.

Sincerely,

Myra Barnes, Lead Clearinghouse Coordinator

MB:MB
Enclosure(s)
cc: Jaime Cramer - BCIT
Greg Golden - DNR
Amanda Degen - MDE
Todd Lang - BMC
Bihui Xu - MDPI-T
Chuck Boyd - MDPL
Beth Cole - MHT

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United States Department of the Interior
OFFICE OF THE SECRETARY
Washington, DC 20240

JAN - 9 2017

ER.15/0695

Mr. Brandon Bratcher
Office of Railroad Policy and Development
U.S. DOT Federal Railroad Administration
1200 New Jersey Avenue, SE
Washington, DC 20590

Subject: Northeast Corridor Baltimore and Potomac Tunnel Project Final EIS/Section 4(f)

Dear Mr. Bratcher:

The Department of the Interior (Department) has reviewed the Final EIS and Section 4(f) Evaluation prepared by the Federal Railroad Administration (FRA) for the Northeast Corridor (NEC) Baltimore and Potomac (B&P) Tunnel Project in Baltimore, MD.

The purpose of the Project is to address the structural and operational deficiencies of the existing B&P Tunnel and to accommodate future high-performance intercity passenger rail service goals for the NEC, including to: reduce travel time through the B&P Tunnel and along the NEC; accommodate existing and projected travel demand for intercity and commuter passenger services; eliminate impediments to existing and projected operations along the NEC; and provide operational reliability, while accounting for the value of the existing tunnel as an important element of Baltimore's rail infrastructure. We offer the following comments on this project for your consideration.

Section 4(f) Evaluation Comments

The Department concurs that the Preferred Alternative has less severe impacts to Section 4(f) resources compared to Alternative 3C and meets the project purpose and need to a greater degree than Alternative 3A. Moreover, the substantial mitigation measures included in the Preferred Alternative, developed in consultation with project consulting parties and Maryland Historical Trust and included in the draft Section 106 Programmatic Agreement, will help to

mitigate the impacts to Section 4(f) resources resulting from the Preferred Alternative. Though the Preferred Alternative requires greater use of Section 4(f) resources compared to Alternative 3A, the benefits of meeting the purpose and need to a greater degree outweighs the remaining harm, after mitigation, to Section 4(f) resources.

We appreciate the opportunity to provide these comments.

Sincerely,

Michaela E. Noble
Director
Office of Environmental Policy
and Compliance

cc: info@bptunnel.com